

Glaucoma Screening In Pseudophakia

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Abstract : India is a developing country with one of the highest cataract surgery rate now. As a result many patients are rendered pseudophakic. Glaucoma in these pseudophakic eyes is a major cause of loss of visual function. The hospital based screening for glaucoma in patients attending ophthalmology clinic is an important measure to diagnose the glaucoma early in its course before significant damage has occurred to the visual function. While a few population based studies in India have estimated the incidence of glaucoma in pseudophakia or Aphakia as a byproduct of their studies, studies on the incidence of glaucoma in patients attending ophthalmology clinic for the cataract surgery of second eye are very few. The opportunity of detecting glaucoma in pseudophakic eyes early and preventing further loss of visual function due to glaucoma is stressed in our study.

Keywords: Glaucoma screening, pseudophakia, cataract surgery complications, aetiopathogenesis of Glaucoma, early detection of Glaucoma

Date of Submission: 11-09-2017

Date of acceptance: 22-09-2017

I. Introduction

Cataract is the most common cause of diminution of vision worldwide and cataract surgery with intra-ocular lens(I.O.L.) implantation is the most common surgery performed worldwide. India has one of the highest cataract surgery rate of about 6 million cataract surgeries per year. Consequently there are many people with pseudophakia. Glaucoma is a chronic progressive optic neuropathy caused by a group of ocular conditions, which lead to damage of the optic nerve with loss of visual function. The most common risk factor known is a raised intraocular pressure. Glaucoma in pseudophakia is one of the many complications or a sequel of the complications of cataract surgery with I.O.L.implantation. As it is well known the glaucoma can exist without any signs and symptoms either pre-operatively or post-operatively and may be detected only in advanced stages, where the patient becomes symptomatic and at a time we are unable to do much.

II. Glaucoma in pseudophakia

The aetiopathogenesis of glaucoma in pseudophakia can be classified depending on the status of the angle of anterior chamber and the post-operative duration at which glaucoma occurs. This also helps the clinicians in taking decisions in individual case diagnosis. The causes of glaucoma are very variable and, in a single case, multiple factors can be responsible for glaucoma. The frequent causes of glaucoma can be classified as follows.

2.1. Open Angle Glaucoma

2.1.1. Early Onset (with in first postoperative week)

- i) Pre-existing Primary Open Angle Glaucoma
- ii) Hyphema
- iii) Retained Visco elastic material
- iv) Idiopathic Pressure elevation

2.1.2. Intermediate Onset (after first postoperative week)

- i) Pre-existing Primary Open Angle Glaucoma
- ii) Vitreous in Anterior chamber
- iii) Hyphema
- iv) Inflammation
- v) Lens Particle glaucoma
- vi) Corticosteroid induced glaucoma
- vii) Ghost Cell glaucoma

2.1.3. Late Onset (more than 2 months postoperatively)

- i) Pre-existing Primary Open Angle Glaucoma
- ii) Ghost cell glaucoma
- iii) Neodymium: Yttrium Aluminium Garnet Laser Capsulotomy
- iv) Vitreous in Anterior chamber
- v) Late occurring Hemorrhage
- vi) Chronic Inflammation

2.2. Angle Closure Glaucoma

2.2.1. With pupillary block

- i) Posterior Capsule
- ii) Intra Ocular Lens
- iii) Posterior Synechiae
- iv) Silicone Oil

2.2.2. Aqueous misdirection (Malignant glaucoma)

2.2.3. Without pupillary block

- i) Preexisting angle-closure glaucoma
- ii) Inflammation / Hyphema
- iii) Prolonged anterior chamber shallowing
- iv) Iris incarceration in cataract surgery incision
- v) Intraocular lens haptics
- vi) Neovascular glaucoma
- vii) Epithelial ingrowth
- viii) Fibrous ingrowth
- ix) Endothelial proliferation
- x) Proliferation of Iris melanocytes across the trabecular meshwork

Secondary angle-closure glaucoma may occur due to a pupillary block, following posterior synechiae to the intra ocular lens or anterior capsule, and consequent forward bowing of the iris. Mydriatics are used to break early posterior synechiae. If this is unsuccessful, it is mandatory to do a large Nd:YAG laser iridotomy or even multiple iridotomies to open loculated pockets of aqueous, after controlling the initial rise of intraocular pressure with medications. Breaking the pupillary block early prevents structural damage to the trabecular meshwork and also causes glaucoma to subside. If the pupillary block has been present for more than a couple of days, a chronic rise of intraocular pressure is likely, persisting even after an iridotomy, and must be treated with antiglaucoma medication as required. Postoperative pupillary block is commonly seen in diabetics. A chronically raised intraocular pressure in the presence of an open angle could be due to the presence of retained cortical lens material, pigment dispersion, free vitreous in the anterior chamber or late fibrosis of the trabecular meshwork. The treatment would be as for any open-angle glaucoma, i.e. medications, trabeculoplasty or surgery, as needed. In 1981 Kratz R.P., Mazzocco T.R., Davidson B et al [1] and in 1983 Kolker A.E., Hetherington J [2] stated that in otherwise normal eyes, the incidence of glaucoma following cataract extraction with IOL implantation was not unduly high.

In 1983, Tuberville AW, Nissenkorn I, Tomoda et al in *Ophthalmology* [3] published that no relationship had been found between the initial IOP and the postoperative pressure rise following ECCE and IOL implantation. In 1985, Savage JA, Thomas JV, Blecher CD et al [4] found that eyes with pre existing primary open angle glaucoma were at higher risk of postoperative IOP rise than non glaucomatous eyes. Eyes with primary narrow glaucoma previously controlled by iridectomy or iridotomy behaved like nonglaucomatous eyes. The presence or absence of posterior chamber IOL did not influence the postoperative IOP rise in medically or Laser controlled glaucomatous eyes, nor in non-glaucomatous eyes. In 1987, Hoskins, who analysed 3579 eyes with anterior chamber IOLs and 2703 eyes with posterior chamber IOLs, found an incidence of secondary glaucoma of 5.5% in the former group, as opposed to only 1.1% in the latter. [5] In 1991, in a major review article in the Survey of Ophthalmology, Karim F Tomey and Carlo E Traverso reviewed all the literature on the glaucomas in aphakia and pseudophakia [6]. They opined that important diagnostic clues of glaucoma in pseudophakia include the anterior chamber depth, the presence or absence of an iridectomy, gonioscopic findings and the appearance of optic nerve head.

III. glaucoma screening

The course of glaucoma is an insidious one and in most cases remains asymptomatic until the visual field and visual acuity have been seriously diminished. Consequently, it is a disease suited to a preventive

approach. Glaucoma surveys are an important means of detecting early cases of glaucoma. Though screening in health care setting is not an alternative to community based surveys, they have the following advantages.

1. Screening in health care setting tests high risk population. This helps to maximize the yield of glaucoma detection program.
2. Patient follow up and compliance are better.
3. All diagnostic aids are available. All treatment options, medical as well as surgical, can be undertaken.

IV. Material And Methods

4.1. Aim of the study: To study the incidence of glaucoma in pseudophakia and evaluate its aetiological factors

4.2. Objectives : To evaluate 1) Incidence of glaucoma and ocular hypertension in pseudophakia

2) Aetiology and risk factors for glaucoma in pseudophakia

3) Clinical strategies for diagnosis of glaucoma in pseudophakia

4.3. Subject Selection:

This is a cross sectional study. This clinical study was carried on 144 pseudophakic eyes of 100 patients who have been operated for cataract with I.O.L. implantation and attended outpatient department of Ophthalmology in our hospital for post-operative review during March to September 2016.

4.4. Inclusion Criteria:

- The minimum period after cataract surgery was 6 weeks, maximum being 5 years.
- All patients who underwent Small Incision Cataract Surgery with posterior chamber intra ocular lens implantation

4.5. Exclusion Criteria:

- Children less than 14 years
- Patients with Pre-existing glaucoma prior to cataract surgery

4.6. Methods:

All patients were investigated after taking proper written informed consent in the following manner.

- 1) Complaints if any
- 2) Date and Place of Surgery
- 3) Detailed Pre-operative history
- 4) Detailed family and personal history
- 5) Details of previous ocular surgery and post-operative treatment history
- 6) Visual Acuity
- 7) Slit Lamp examination
- 8) Intra Ocular Pressure Recording (Goldman Applanation Tonometer)
- 9) Fundus Examination
- 10) Visual Field Analysis (Automated Perimetry) wherever possible
- 11) Gonioscopy (4 mirror Posner Lens)

V. Observation And Results

Totally 144 pseudophakic eyes of 100 patients were screened for glaucoma. 56 patients underwent cataract surgery for the first time. In these patients, the eye that underwent cataract surgery with pseudophakia was considered for the study. Remaining 44 patients underwent cataract surgery in one eye previously and came for the cataract surgery in the fellow eye. In these patients, both pseudophakic eyes were

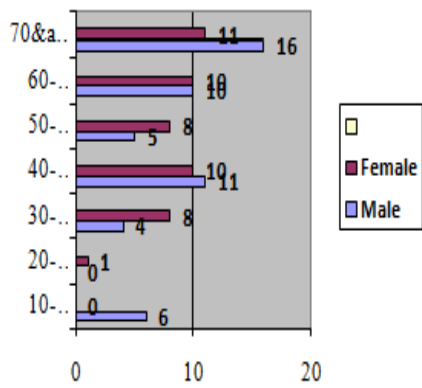


Figure 1. Age and Sex distribution of patients

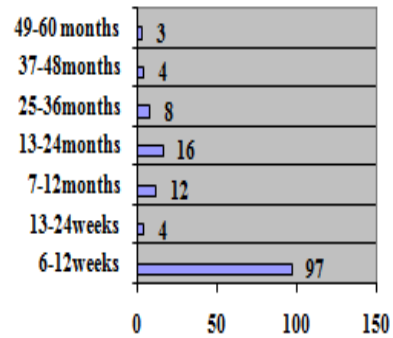


Figure 2. Duration of Post-operative follow up

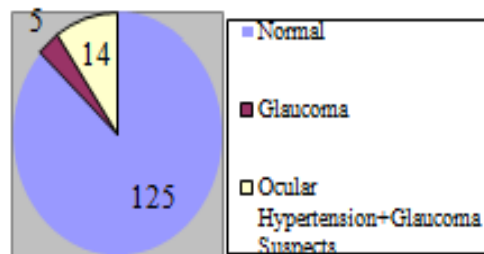


Figure 3. Incidence of Glaucoma- No. of eyes

| Type of Cataract | Male | Female | Total |
|--------------------------------|-----------|-----------|------------|
| Immature Cataract | 20 | 16 | 36 |
| Mature Cataract | 10 | 14 | 24 |
| Hyper mature Cataract | 5 | 2 | 7 |
| Nuclear Cataract | 2 | 7 | 9 |
| Posterior Subcapsular Cataract | 2 | 5 | 7 |
| Complicated Cataract | 2 | 2 | 4 |
| Traumatic Cataract | 8 | 1 | 9 |
| Lens Induced Glaucoma | 3 | 1 | 4 |
| Total | 52 | 48 | 100 |

Note: The pre-operative diagnosis of the type of cataract in the already operated eye of binocular pseudophakic patients is not known as the patients did not have previous surgery records

Table 1. I.O.P. measurements in Post Operative Period Table 2. Type of Cataract-Sex wise Distribution

| S.No. | I.O.P. (mm.of Hg) | No. of eyes | Percentage |
|-------|-------------------|-------------|------------|
| 1 | 0-10 | 3 | 2.08% |
| 2 | 10.1-15 | 31 | 21.52% |
| 3 | 15.1-21 | 91 | 63.19% |
| 4 | 21.1-25 | 12 | 8.33% |
| 5 | 25.1-30 | 4 | 2.77% |
| 6 | 30.1-35 | 2 | 1.38% |

| | | | |
|--------------|----------------|------------|--------------|
| 7 | 35.1-40 | 1 | 0.69% |
| Total | | 144 | |

Out of the 19 eyes which had I.O.P. more than 21mm of Hg, 14 eyes had normal optic discs and normal visual fields. Remaining 5 eyes had I.O.P. more than 21mm of Hg and Ophthalmoscopic signs suggestive of glaucoma. Two of them had advanced glaucomatous visual field defects with only central 20⁰ of the visual field present. Two eyes had normal visual field and one patient could not do visual field test due to poor vision. Further analysis was done in all 19 eyes which had I.O.P. more than 21mm of Hg.as to the causative factor for the I.O.P. rise. 6 eyes had retained cortical lens material. 3 eyes underwent cataract surgery for traumatic cataract , with postoperative inflammation. 2 eyes had postoperative inflammation and 2 eyes underwent Nd:YAG laser posterior capsulotomy in postoperative period. One eye each had angle recession, preexisting primary open angle glaucoma, and normal tension glaucoma. 3 eyes were normal .

VI. Discussion

In our study, screening for glaucoma in 144 pseudophakic eyes of 100 patients was done and the results were analysed to evaluate its incidence and aetiological factors. The incidence of glaucoma in pseudophakia was found to be 3.47% (5 eyes out of 144 eyes). The incidence of ocular hypertension was 9.72% (14 eyes out of 144 eyes). The common aetiological factors for glaucoma in pseudophakia in our study were retained cortical lens material, postoperative inflammation, surgery for traumatic cataract, and Nd:YAG laser posterior capsulotomy. The combination of Clinical examination by Slit lamp biomicroscope,I.O.P. measurement , Optic disc evaluation and visual field examination wherever possible yielded optimal results in our screening.

The incidence of glaucoma and ocular hypertension were higher in eyes that had retained cortical lens material, postoperative inflammation and after Nd:YAG laser capsulotomy. This indicated that postoperative inflammation was important factor contributing to postoperative rise of I.O.P. in eyes undergoing cataract surgery. The blockage of trabecular meshwork by the inflammatory cells or cortical lens material, and trabeculitis appears to be the mechanism. The prevalence of glaucoma and ocular hypertension were higher in eyes that had inflammation prior to cataract surgery, as in traumatic cataract, lens induced glaucoma, and complicated cataracts secondary to uveitis

The incidence of glaucoma in pseudophakia in our study was 3.47%, which was comparable to 5.99% as in Chennai glaucoma study [7]. They had included preexisting glaucoma patients whereas in our study these were excluded. Furthermore our study was done in patients attending our hospital for second eye cataract surgery. Another population based study ,the Andhra Pradesh eye Diseases Study (APEDS) conducted in the urban Indian city of Hyderabad reported a prevalence of 14.6% in their population ,which is higher than our estimate [8]. The facts that APEDS and Chennai Glaucoma study were done in urban population, where access to eye care facilities is more, people have lower threshold for cataract surgery, and both studies were population based with inclusion of pre existing glaucoma patients , may account for the difference observed in the glaucoma in pseudophakia between these three communities which are ethnically, geographically, and culturally much closer to each other.

The importance of screening for glaucoma in pseudophakia is based on the fact that glaucoma is more often insidious, asymptomatic and affects the central vision late in its course. Early diagnosis and proper clinical assessment to find the cause of glaucoma is essential to proper management of these eyes. Often the patients are unaware of this disease and screening for glaucoma in all pseudophakic eyes can be done in the last post operative visit after cataract surgery or at the time of cataract surgery of the fellow eye. This study highlights the importance of comprehensive clinical examination of all the pseudophakic eyes in screening for glaucoma diagnosis and find its causes. The combination of optic disc evaluation with +90D/+78D lens, I.O.P.measurement by Goldmann appplanation Tonometry, Gonioscopy and visual field analysis by automated perimetry wherever feasible gives good results.

Our study has been done in hospital patients who seek eye care mainly for fellow eye cataract surgery. It is not a population based study. It has been done by qualified Ophthalmologists with equipment for comprehensive clinical examination. These limitations are commonly encountered in all hospital based glaucoma screening programmes. Population based glaucoma screening requires lot of equipment, human resources, and awareness among the people being screened. A comprehensive population based screening for detection of glaucoma, diabetic retinopathy and age related macular degeneration is needed to take further steps in preventing these important and prevalent causes of blindness in India. The screening should motivate and include all the persons who have undergone a cataract surgery as bilateral pseudophakics are less willing to attend these screening camps as they lack awareness of these potentially blinding disease.

VII. Conclusion

- Glaucoma screening was done in 144 pseudophakic eyes
- The follow up period after cataract surgery varied from 6 weeks to 5 years.
- Positive glaucoma cases were detected in 5 eyes (3.47%)
- A combination of I.O.P. measurement and Ophthalmoscopy increased the yield of the glaucoma screening
- Ocular Hypertension was noted in 14 eyes
- Post operative inflammation is the frequent cause of glaucoma in pseudophakia
- Retained cortical matter per se , or the post operative uveitis due to it, frequently leads to Ocular Hypertension and glaucoma in pseudophakia.
- Raised I.O.P. occurs more frequently in eyes operated for Immature Senile Cortical Cataract and Traumatic Cataract than in eyes operated for mature, hypermature, and Nuclear cataracts.
- Routine and regular measurement of I.O.P. and Ophthalmoscopy at 6th week post operative visit is advised in pseudophakic eyes for early detection of Ocular Hypertension and Glaucoma in pseudophakia.
- Appropriate management of Ocular Hypertension and Glaucoma can prevent irreversible glaucomatous optic nerve damage.

Acknowledgements

We acknowledge our colleagues, staff and family members for their encouragement and support in every step of this research work.

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*Dr.Ravikiran.P. "Glaucoma Screening In Pseudophakia ." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)* , vol. 16, no. 09, 2017, pp. 43–48.