



CLINICAL STUDY AND MANAGEMENT OF SECONDARY GLAUCOMA-A CROSS SECTIONAL STUDY

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Abstract

Glaucoma is a chronic, progressive optic neuropathy caused by a group of eye diseases that lead to damage to the optic nerve head and a change in visual field. The most common risk factor generally acknowledged is a rise in intraocular pressure. Quite a few times secondary glaucoma goes undiagnosed. WHO states that over 7.7 million persons with glaucomatous optic neuropathy are thought to exist in the globe. This was a hospital based Clinical cross-sectional study. The aim of my study is to Prevent blindness due to secondary glaucoma. This was an OPD based study which consisted of 105 patients of secondary glaucoma. The duration of the study was for 18 months, it was conducted on patients aged 25- 80 yrs, Examinations were performed by direct and indirect ophthalmoscopes, gonioscopy was performed, the patients treatments were tailored to each individual. This study found that maximum number of patients belonged to the age group between 61-70yrs that is (21%) followed by 51-60yrs having (19%), 41-50yrs having (16.2%), 71-80yrs & 20-30yrs having (15.2%) and 31-40 having the least amount of patients i.e.(13.2%). The study concluded that secondary glaucoma is very common in the older age and low socioeconomic group as they tend to prolong the treatment for cataract and in the end lead to secondary angle closure glaucoma.

Keywords: Secondary glaucoma, lens induced glaucoma, Neovascular Glaucoma, Pseudoexfoliation glaucoma.

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1. Introduction

Glaucoma is a chronic, progressive optic neuropathy caused by a group of eye diseases that lead to damage to the optic nerve head and a change in visual field. The most common risk factor generally acknowledged is a rise in intraocular pressure.(Davis et al 2016) Primary or secondary glaucoma are the two categories. Primary glaucoma is impacted by genetics. Secondary glaucoma occur when an underlying main ocular or systemic disease causes the IOP to increase.

Quite a few times secondary glaucoma goes undiagnosed or even if it is diagnosed it's treatment varies with each type of glaucoma. Consequently, early detection and treatment are crucial to preventing vision deterioration.

The main cause of permanent blindness in the globe is glaucoma. According to WHO over 7.7 million persons with glaucomatous optic neuropathy are thought to exist in the globe.(GBD 2019) By 2040, it is estimated that there will be 111.8 million cases of glaucoma worldwide.(Tham et al 2014)

In a recent study done in Aligarh of 680 total patients overall prevalence of glaucoma was found to be 5%, of which secondary glaucoma was 1% .(Ahmad et al 2019) Secondary glaucoma is divided into secondary open angle and secondary angle closure and these are further divided by basis of different mechanisms of causing secondary glaucoma

According to a study of 7079 patients conducted in Nepal on Glaucoma patients, 528 had secondary glaucoma i.e. 7% of the total cases. Out of these the most common was Lens-induced 33% then came Neo-vascular 20% followed by steroid-induced 16%, Trauma-induced 14%, Post-Vitrectomy Sx 3%, due to Uveitis 2%.(Gurung et al 2021)

Sometimes the treatment can also lead to further complications, as the side effect of corticosteroid usage as well as the disease itself, patients with uveitis are more likely to have a rise in intraocular pressure.(Siddique et al 2013) Hence the treatment has to be carefully monitored.

Therapeutic modalities differ from one variety to another and what treatment is advised in one may not be the ideal treatment in the other type of sec.glaucoma.

In pigmentary dispersion syndrome which is a type of secondary open angle glaucoma, characterised by Trabecular Meshwork pigmentation, mid-peripheral radial iris transillumination abnormalities, and corneal endothelial pigment depositions on the posterior side of the cornea.(SUGAR et al 1947)

Laser P.I. is considered a treatment modality and also has a protective role against rise of IOP over the course of 10yrs.(Gandolfi SA et al 2014)

Nd:YAG laser capsulotomy which is a method for treating posterior capsular opacification is known to disrupt the anterior hyaloid phase in 33% of instances, according to many publications.(Li, E. Y et al 2011) It causes the anterior vitreous to prolapse out of the posterior segment into the anterior segment and block the pupil leading to secondary glaucoma.

Therefore the medical management of secondary glaucoma is different from that of primary glaucoma as it requires additional treatment of the secondary cause & must be tailored to the patient. Surgical treatment of secondary glaucoma's also varies according to each type.

This hospital based study is to be done to bridge this gap of finding out the most common type of secondary glaucoma, the ratio of male and female, the mean age of people affected by secondary glaucoma and the various modalities of treating them.

2. Material and Methods

The present study was approved by university ethical committee.

Organisation: Department of ophthalmology, Santosh medical college and hospital , Ghaziabad

Study setting : OPD based

Study design: hospital based Clinical cross-sectional study

Study duration : 18 months

Study unit: 20 – 80 yrs.

Sample size: 105 cases was taken as sample size

Based on formula $n = (Z_{1-\alpha/2})^2 P(1-P)/d^2$ where $p=7.4\%$ Prevalence (as per previous study)5, $z=1.96$ at 5% significance, $d=$ absolute error (5%) corresponding to effect size

$n = 105.29=105$

Patient selection: All subjects in the study were included after getting written informed consent from them .All secondary glaucoma Patient attending eye OPD at santosh hospital Ghaziabad

Inclusion criteria: Patients aged 25-80 yrs medically diagnosed with secondary glaucoma

Exclusion criteria:

- All patients diagnosed with primary glaucoma's
- All patients diagnosed with developmental glaucoma's

History : Detailed history was taken regarding the onset and progression of the ocular and systemic symptoms.

Visual Acuity: Using Snellen's digital chart visual acuity was determined from 6/6 to finger counting at 1m, projection of rays, perception of light.

Tonometry: The intraocular pressure was measured using Goldman applanation tonometer by making the patient sit on the slit lamp, staining with fluorescein Dye and installing a drop of Proparacain 0.5%. The prism was positioned on the cornea and applanated to form the mires, the reading is taken by rotating the dial. In some patients with corneal pathology a Non contact tonometer was used to measure the intraocular pressure.

Slit Lamp Examination : The patient is made to sit on the slit lamp and examined in diffuse light for pupillary reaction, any corneal abnormality, iris details and lens opacities. On beam examination the corneal layers and endothelium, anterior chamber depth was measured using Van Herick method and other pathology cells, presence of any neovascularisation on iris, all are examined.

Gonioscopy : The patient was made to sit on the slit lamp, one drop of proparacain 0.5% was installed, using a coupling agent (HPMC) the 3 Mirror Gonioscope was placed on the cornea and using the 59^o Mirror the angle of Anterior chamber was observed and is graded whether open or closed according to Shaffer's grading.

Slit lamp Bio microscopy : Using 78D Volk lens the patient was positioned on the slit lamp and the Optic disc was examined for the colour, size, shape, Cup:Disc, cup depth, any notching & Neuroretinal-rim.

Indirect ophthalmoscopy: It was performed using 20D Volk lens and an Appa indirect ophthalmoscope, the patient was dilated with tropicamide 0.5% drops for 3 times every 15min, the patient was made to lie in the dark room procedure bed and the fundus on a whole was examined for the fundal glow, presence of any Neovascularisation, venous or artereolar occlusion, chroidal patches & vitreous haemorrhage.

Management :

In cases of Phacomorphic Glaucoma: Intra venous manitol 300ml slowly with 2 Tab. Acetazolamide 250mg Stat was given to reduce the intra ocular pressure. After the pressure reduced and the patient was comfortable, the patient was shifted to the operation theater for undergoing emergency manual small incision cataract surgery and trabeculectomy combined procedure. The patient was followed up after 1,3,15,30 days

In cases of Neovascular Glaucoma: Intra venous Manitol 300ml slow with 2tabs of acetazolamide

250mg stat was given after which Intra-vitreol Ranibizumab 0.1ml was given, topical anti glaucoma drugs (timolol) was started twice daily and one week after pan retinal photo-coagulation was performed. The patient was followed up at 1,3,6 months.

In cases of Uveitic glaucoma : Topical Steroid (Prednisolone 1%) was given to decrease the inflammation 6-8times, topical cycloplegic & Mydriatic (Atropine1%) was given to decrease pain and to break synechae and a topical anti glaucoma drugs (timolol+Brimonidine combination) was given twice daily, in cases with pupillary block and iris bombay intravenous manitol 300ml slow with 2tabs of acetazolamide 250mg stat was given after which a Lazer Pheripheral Iridotomy was also performed. Patient was followed up after 1,2,3 weeks.

In cases of ICE (iridocorneal endothelial syndrome) : Topical anti glaucoma drugs (timolol) was started twice daily, trabeculectomy was performed and the patient was followed up after 1,2,3 weeks.

In cases of Pseudoexfoliation glaucoma : Oral & topical anti galucoma drugs (timolol + Brimonidine combination+ acetazolamide 250mg) are given twice daily and phacoemulsification is done to remove the lens. Patient is followed up for 6weeks.

In cases of Traumatic Hyphema : If the Intra ocular pressure was less than 40mmhg, the patient received a topical mydriatic(Homatropine) + topical steroid (predforte) + topical anti glaucoma drugs(timolol + Brimonidine combination). If the pressure was greater than 40mmhg, the patient received iv. Manitol 300ml slow + tab. Acetazolamide 250mg X2 stat + topical anti glaucoma drugs TimololB + oral and topical steroid wysolone 20mg OD + Predforte 1% half hourly and the patient was taken up for AC wash. Patient is followed up daily in opd for 1week then weekly for 1 month.

In cases of steroid induced glaucoma : first the drug was stopped or if it couldn't be stopped the treating doctor was consulted and the patient was kept on the minimum dose. The patient was put on anti glaucoma drugs to acutely decrease the pressure. The patient was observed for 1 month if the iop still remained high then anti glaucoma drugs were continued.

In pigmentary dispersion : Topical anti glaucoma drugs (timolol) was started twice daily and the patient was taken up for surgical peripheral iridotomy. The patient was followed up on 1,3,10,15 post op days.

In silicone oil induced secondary glaucoma : The patient was put on topical anti glaucoma drugs and a glaucoma drainage device(Ahmed valve) was put in such patients.

In patients of angle recession glaucoma : Oral anti-glaucoma drugs(acetazolamide 250mg), topical anti glaucoma drugs(timolol + Brimonidine combination)was given. The patient was taken up for Ahmed valve implantation later.

3. Results

A total of 105 cases of Secondary glaucoma were taken as part of this study. They included phacomorphic, neovascular, traumatic, uveitic, steroid induced, PXG, pigment dispersion, silicone oil induced, ICE(Iredo-corneal endothelial syndrome), angle recession glaucoma.

It was observed that the maximum number of patients belonged to the age group between 61-70yrs that is 22 patients (21%) followed by 51-60yrs having 20 patients (19%), 41-50yrs having 17 patients (16.2%), 71-80yrs & 20-30yrs having 16 patients each (15.2%) and 31-40 having the least amount of patients i.e. 14 (13.2%). This has been depicted in **Table1**

Table.2 shows the gender distribution of secondary glaucoma.The males constituted 56 patients (53.33%), the females constituted 49 patients (46.7%). The male to female ratio was 1.4:1. Males were 1.4 times more common to have secondary glaucoma.

Table.3 shows the various secondary glaucoma's that were encountered during the study period. The most commonly encountered secondary glaucoma was Phacomorphic secondary angle closure glaucoma with a total of 35 cases (33.3%), preceded by neovascular glaucoma with a total of 25 cases (23%), followed by uveitic glaucoma with 16 cases (15.3%), followed by traumatic hyphema

and steroid induced glaucoma with 7 cases each (6.6%), then comes Pseudo exfoliation glaucoma(PXG) with 6 cases (5.7%), then comes Pigment dispersion syndrome with a total of 4 cases (3.8%), proceeded by Silicone oil induced secondary glaucoma having 3 cases (2.8%), the least common were angle recession glaucoma and iridocorneal endothelial glaucoma(ICE) both having 1 case each (0.96%) out of 105 cases

Table.4 shows us the anterior chamber morphology on gonioscopy. The patients with open angle secondary glaucoma were 28 (27%) whereas the patients with angle closure secondary glaucoma were 77 (73.%).

Table.5 shows the number of secondary open angle glaucoma patients and its types that were encountered during this study. It consisted of a total of 28 patients out of 105 patients. The two most common secondary open angle glaucoma types encountered were traumatic hyphema and steroid induced both having 7 patients each (25%), followed by PXG having 6 patients (21.4%), then came pigment dispersion glaucoma with 4 cases (14.3%), preceded by silicone oil induced glaucoma with 3 cases and the least being angle recession with 1 case (3.6%). The total cases of secondary open angle glaucoma were 28.

Table.6 shows the various secondary angle closure glaucoma patients and their percentage. The most common type encountered was phacomorphic secondary angle closure glaucoma 35 cases (45.5%), then came neovascular secondary glaucoma with 25 cases (32.5%), preceded by uveitic secondary angle closure glaucoma with 16 cases (20.8%) and the least was ICE with 1 case (1.3%). The total cases of secondary angle closure glaucoma were 77.

Table.7 shows the number and the percentage of patients that underwent either only medical management 44 patients (41.9%) or medical + surgical management 61 patients (58.10%).

Table1. Showing the age distribution of secondary glaucoma.

| Gender | No. Of patients | Percent |
|--------|-----------------|---------|
| Male | 56 | 53.33 |
| Female | 49 | 46.67 |

Table.2 shows the gender distribution

| Type of sec. glaucoma | No. Of cases | Percentage |
|-----------------------|--------------|------------|
| Phacomorphic | 35 | 33.3 |
| Neovascular | 25 | 23.8 |
| Uveitic | 16 | 15.3 |
| Traumatic hyphema | 7 | 6.6 |
| Steroid induced | 7 | 6.6 |
| PXG | 6 | 5.7 |
| Pigment Disp | 4 | 3.8 |
| Silicone Oil | 3 | 2.8 |
| Angle recession | 1 | 0.96 |
| ICE | 1 | 0.96 |

Table.3 Various secondary glaucoma's encountered in this study.

| Gonioscopy | No. of patients | Percentage |
|--------------|-----------------|------------|
| Open angle | 28 | 27 |
| Closed angle | 77 | 73 |

Table.4 shows the anterior chamber morphology

| Secondary Open angle | | |
|----------------------|-----------------|------------|
| Type | No. of patients | Percentage |
| Traumatic hyphema | 7 | 25 |
| Steroid induced | 7 | 25 |
| PXG | 6 | 21.4 |
| Pigment Disp | 4 | 14.3 |
| Silicone Oil | 3 | 10.7 |
| Angle recession | 1 | 3.6 |

| Secondary Open angle | | |
|----------------------|----|--|
| total | 28 | |

Table.5 shows number of patients with different types of secondary open angle glaucoma.

| Secondary angle closure glaucoma | | |
|----------------------------------|-----------------|------------|
| Type | No. of patients | Percentage |
| Phacomorphic | 35 | 45.5 |
| Neovascular | 25 | 32.5 |
| Uveitic | 16 | 20.8 |
| ICE | 1 | 1.3 |
| Total | 77 | |

Table.6 shows the number of patients with different type of secondary angle closure glaucoma

| Management | No. of patients | Percent |
|-----------------------|-----------------|---------|
| Medical only | 44 | 41.90 |
| Medical with surgical | 61 | 58.10 |

Table.7 shows the management of secondary glaucoma

| Age distribution of secondary glaucoma | | |
|--|-----------------|------------|
| Age | No. of patients | Percentage |
| 20-30 | 16 | 15.2 |
| 31-40 | 14 | 13.2 |
| 41-50 | 17 | 16.2 |
| 51-60 | 20 | 19 |
| 61-70 | 22 | 21 |
| 71-80 | 16 | 15.2 |
| Total | 105 | |

4. Discussion

WHO states that over 7.7 million persons with glaucomatous optic neuropathy are thought to exist in the globe.(GBD 2019) It is estimated that there will be 111.8 million cases of glaucoma worldwide by 2040.(Tham et al 2014) Studies regarding the current pattern of secondary glaucoma in our region haven't been performed.

This study included patients from the age of 20-80 yrs, with most patients of secondary glaucoma being in the age group of 61-70 that is 22 patients (21%) followed by 51-60yrs having 20 patients (19%), 41-50yrs having 17 patients (16.2%), 71-80yrs & 20-30yrs having 16 patients each (15.2%) and 31-40 having the least amount of patients i.e. 14 (13.2%). Gong H et al in 2021 also found that the mean age of the patients with secondary glaucoma was 44.45 ± 19.45 years old.(Gong, H et al 2021)

In this study the males constituted 56 patients (53.33%), the females constituted 49 patients (46.7%). The male to female ratio was 1.4:1. Males were 1.4 times more common to have secondary glaucoma. Sherpa, D et al concluded that 35 (59.28%) were male and 24 (40.66%) were female with male and female ratio to be 1.46:1(Sherpa, D., & Pokhrel, S 2017) and Gong H et al also found men (66.94%)(Gong, H et al 2021) were more vulnerable than women to get secondary glaucoma.

In this study the patients with open angle secondary glaucoma were 28 (27%) whereas the patients with angle closure secondary glaucoma were 77 (73.%). The most common in open angle was traumatic hyphema and steroid induced both having 7 patients each (25%). The most common in angle closure was phacomorphic secondary angle closure glaucoma 35 cases (45.5%). Ajite KO et al also found traumatic hyphema to be the most common cause of secondary open angle glaucoma.(Ajite KO et al 2015) Gurung J et al also found the most common cause of secondary angle closure glaucoma was lens induced glaucoma.(Gurung et al 2021)

It was found that most patients required medical plus surgical treatment for long term control of intra-ocular pressure (58.10%). Krishnadas R et al said that the treatment depends on whether the patients has useful vision if so the goal of treatment should be to decrease IOP, lessen any accompanying inflammation, address the underlying cause (such as by removing a hyphaema or a hypermature lens), and do additional procedures to restore vision. Once the eye has become calm and stable, glaucoma surgery or long-term IOP control medication may be necessary.(Krishnadas R, Ramakrishnan R 2001)

It was found that PXG can be treated and controlled by Oral & topical anti galucoma drugs (timolol + Brimonidine combination+ acetazolamide 250mg)

are given twice daily and phacoemulsification while Hemalatha BC et al conducted MSICS in most cases(Hemalatha, B. C., & Shetty, S. B. 2016)

It was found that phacomorphic glaucoma to be treated by Intra venous manitol 300ml slowly with 2 Tab. Acetazolamide 250mg Stat, manual small incision cataract surgery and trabeculectomy combined procedure. Moraru A et al conducted a study on 38 eyes and found that the treatment with phacoemulsification or extracapsular extraction was enough to control IOP.(Moraru, A et al 2017)

5. Conclusion

Secondary glaucoma is very common in the older age and low socioeconomic group as they tend to prolong the treatment for cataract and in the end lead to secondary angle closure glaucoma, people with diabetes & hypertension should get regular ocular checkups including gonioscopy as they have a tendency for neovascularisation. Patients on steroids oral and topical should be monitored and screened for secondary steroid induced glaucoma hence the medical practitioner treating such patients should be made aware regarding the repercussions. Patients with TB, rheumatoid arthritis, hyperlipidemia, should be monitored closely as they have the tendency to develop secondary uveitic glaucoma. In this study we also found that secondary angle closure glaucoma than secondary open angle glaucoma, most patients required some form surgical intervention

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Conflict of interest

There are no conflict of interest.

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