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Original Research Article

A Comparative Study of Treatment of Neovascular Glaucoma

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Abstract

Background: A fibrovascular membrane that forms on the surface of the iris and the angle is the primary cause of the secondary form of glaucoma known as neovascular glaucoma. It is generally accompanied by other anomalies, mainly ischemia, and it never occurs as a basic disorder. The study's primary goal was to evaluate the impact of trabeculectomy surgery in neovascular glaucoma patients in comparison to Mitomycin C Ologen implant/glaucoma drainage device surgery.

Methods: N=30 Patients with neovascular glaucoma seen at the ophthalmology Department of the Prathima Institute of Medical Sciences, Naganoor, Karimnagar, were thoroughly assessed. Randomly, n=10 of these patients had trabeculectomy with mitomycin C (Group I), N=10 received trabeculectomy with an implanted ologen (Group II), and n=10 received glaucoma drainage device implant surgery (Group III). The visual result, postoperative complications, and intraocular pressure management were evaluated and compared.

Results: The mean IOP reductions were 27.5 mmHg in Group I, 26.8 mmHg in Group II, and 23.15 mmHg in Group III. A maximum weekly mean IOP decrease was observed in group II. After 12 weeks, there was no statistically significant difference between these three groups' mean IOP reductions. Preoperative visual acuity for the majority of patients ranged from PL to 1/60. In Group II, N=3 patients had improved eyesight. After surgery, the majority of the patients experienced decreased eyesight.

Conclusion: Neovascular glaucoma presents more commonly in advanced ages and is more commonly affected in males. In the first week, patients treated with Trab and glaucoma implants had a lower IOP than the other two groups, but after 12 weeks, the mean IOP decrease was the same in all three groups. Compared to the other 2 Groups, patients treated with Trab with ologen Implants experienced the fewest post-operative complications.

Keywords: Neovascular glaucoma, surgical management, Intraocular pressure, Ologen Implants

Introduction

Glaucoma is a chronic, progressive optic neuropathy brought on by several ocular pathologies that induce distinctive alterations in the optic nerve head's structure, as well as distinctive visual and accompanying field modifications. Raised intra-ocular pressure is the most frequent risk factor. Neovascular glaucoma is the

development of a fibrovascular membrane on the surface of the iris and the angle is the primary cause of secondary glaucoma. Neovascular glaucoma is never the only abnormality present; it is almost always accompanied by ischemia. [1] Glaucoma is regarded as the second most common cause of blindness after cataracts. It results in permanent blindness. It has been determined that 66 million people globally are affected. [2] Early identification and therapy are essential since the condition has the potential to cause permanent blindness. The intraocular pressure could or might not increase. Intraocular pressure is the sole modifiable risk factor. There are three types of glaucoma: congenital, primary, and secondary. Primary open-angle glaucoma and primary-angle closure glaucoma are two further categories of primary glaucoma. [3] These exhibit open angles and closed angles on gonioscopy, respectively, in addition to the typical conspicuous findings of alterations in the optic disc and vision loss. Ocular hypertension and normotensive glaucoma are two variations of primary open-angle glaucoma. Some researchers regard them as they are distinct entities. [4] Ocular hypertension describes circumstances when the intraocular pressure is increased but there are no alterations to the optic nerve head or visual fields. Entities with glaucomatous alterations to the optic disc are referred to be normotensive or low-tension glaucomas. [5] On the other hand, secondary glaucomas are typically linked with other ocular or systemic illnesses and are typically unilateral (though they can occasionally be bilateral). Again, there are two types of secondary glaucomas: open angle and closed angle. Pigmentary glaucoma, pseudoexfoliation glaucoma, steroid-induced glaucoma, lens-induced glaucoma, ghost cell glaucoma, hemolytic glaucoma, UGH syndrome (uveitis, glaucoma, and hyphaema), Posner Schlossman syndrome, Fuchs heterochromiciridocyclitis, etc. are a few of the causes of secondary Iridocorneal endothelial syndromes, [5] posterior polymorphous dystrophy, fibrous in growth, penetrating keratoplasty, aniridia, ciliary block or malignant glaucoma, intraocular tumors, nanophthalmos, suprachoroidal hemorrhage and ciliochoroidal effusions, retrolental fibroplasia, neovascular glaucoma, etc. are examples of secondary angle closure glaucoma. [6] Neovascular glaucoma is secondary glaucoma with the potential to lead to absolute glaucoma, however, it may be avoided if the etiology is discovered in good time and treated quickly. It might appear at any point and take the form of open or closed angles.

Material and Methods

This cross-sectional study was conducted among the patients presenting with ocular complaints presenting to the Department of Ophthalmology, Prathima Institute of Medical Sciences, Naganoor, Telangana State. Institutional Ethical approval was obtained for the study. Written consent was taken from all the patients in the study. A thorough history was taken before a methodical eye examination was performed.

Inclusion Criteria

1. All patients with neovascular glaucoma of varied etiology
2. Patients who accepted treatment.
3. Patients with vision more than the perception of light, raised intraocular pressure, neovascularization of the iris, angle, and elsewhere in the fundus.
4. Patients with a follow-up period of at least twelve weeks

Exclusion criteria

1. Patients with primary glaucoma.
2. Patients with dilated vessels alone in the iris without evidence of new vessels
3. Patients with other types of secondary glaucoma.

Neovascular glaucoma was assessed in terms of a thorough history of the

condition's genesis, course, symptoms, and systemic and ocular risk factors such as diabetes, hypertension, vascular disorders, and chronic uveitis. Patients had a complete evaluation that included a physical examination of their eyes and overall health. Slit lamp biomicroscopy, tonometry, gonioscopy, visual acuity recording, fundus examination, and in certain circumstances fundus fluorescein angiography and ultrasound examination of the anterior region were performed. Urine samples were tested for albumin and sugar in those with diabetes suspicions and those with a family history of the disease. The following information was investigated in the anterior section. Edema, haziness and opacity, vascularization, bullous keratopathy, and keratic precipitates on the cornea. Hyphaema, flare, and cells in the anterior chamber. Neovascularization of the iris, including nodular thickening, atrophic areas, and patterning. Pupil reaction, posterior synechiae, and inflammation of the uveal membrane. cataract, pseudophakia, and aphakia in the lens.

Tonometry: When possible, intraocular pressure was measured using a Goldmannapplanation tonometer, non-contact tonometry, and a Schiotz tonometer with standard weights.

Gonioscopy: With the use of a Goldmann single mirror indirect goniolens, an angle's grading according to Shaffer's grading, the existence and degree of neovascularization, and peripheral anterior synechiae were all noticed. Based on the degree of iris neovascularization, angle neovascularization, the presence of peripheral anterior synechiae, and the number of quadrants involved, neovascularization was graded.

Posterior segment Examination: When the clarity of the media allowed, posterior segment examination was performed in both eyes using a direct, indirect ophthalmoscope, slit lamp biomicroscopy with a 90D lens, and a Goldmann 3 mirror fundus contact lens.

Visual Field: Due to decreased visual acuity, visual field charting was not achievable in the afflicted eyes. With the help of the Bjerrum screen and automated perimetry in the other eye, central and periphery communication was conducted.

Examination with ultrasound: When the posterior segment could not be seen, several patients underwent a B scan to check for vitreous hemorrhage and retinal detachment.

All patients received the same course of therapy, which comprised topical steroids four times per day, 0.5% timolol twice daily, oral acetazolamide 250 mg QID, oral glycerol 30ml twice a day (if not diabetic), and 1% atropine (whenever indicated). A total of n=30 patients were divided equally into three groups created for each type of therapy. Trabeculectomy with Mitomycin C was administered to 10 patients. A sponge dipped in 0.2 mg/ml as the dose for 2 to 4 minutes. In powder form, 1 vial contains 2 mg or 10 mg.

Trabeculectomy combined with an Ologen implant was used to treat n=10 patients. It is a porous, biodegradable collagen implant made of glycosaminoglycans and cross-linked atelocollagen. It comes in 6mmx 2mm and 10mm x10mm x2mm sizes. N=10 cases had surgery to implant a Keiki Mehta valve, a drainage device for glaucoma. It offers an aqueous shunt from the anterior chamber to the suprachoroidal and subtenon spaces.

Follow-up examination: First post-operative day, first week, sixth week, and twelfth-week examinations were performed on all patients. Each time a patient visited, the anterior segment was examined using a slit lamp for biomicroscopy, Tonometry, Gonioscopy, visual acuity testing, and fundus inspection. Evaluations included the regulation of intraocular pressure, visual results, and postoperative complications.

The optimum technique of therapy was determined after comparing the effects of several treatment options.

Statistical analysis: The data was collected and uploaded on an MS Excel spreadsheet and analyzed by SPSS version 22 (Chicago, IL, USA). Quantitative variables were expressed on mean and standard deviations and qualitative variables were expressed in proportions and percentages. ANOVA test has been used to find the difference between the proportions.

Results

The age range of the group of patients was from 38 years to 66 years the mean age of the study group was 55.5 ± 8.5 years. The maximum number of cases of neovascular glaucoma was in the age group of 50 -60 years with 60% of all the cases followed by 20% of cases in the age group above 61 years and 13.33%were distributed in the age groups 41 – 50 years and 6.67% cases were in the age group of 31 – 40 years details have been depicted in figure 1.

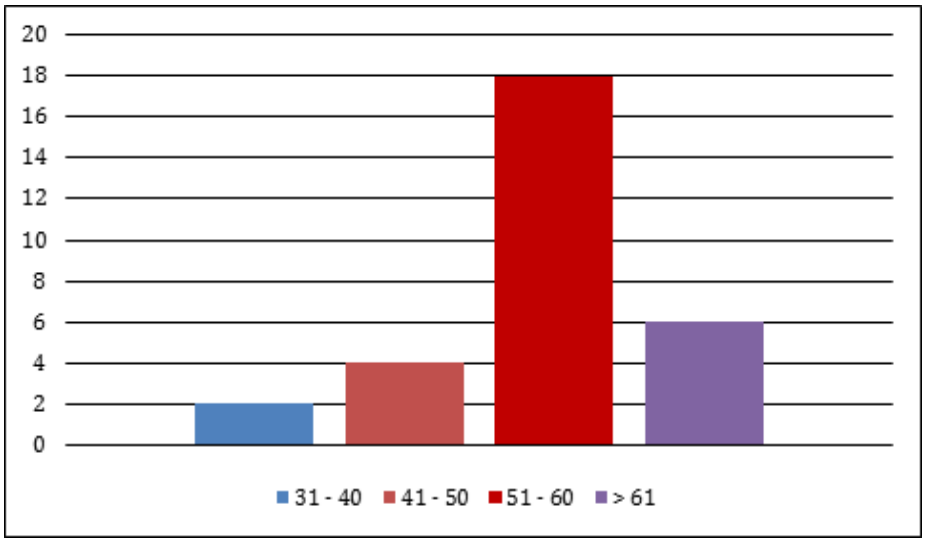

Figure 1: Distribution of cases in the study based on the age groups

Diabetic Neovascular glaucoma presented at an earlier age compared to Neovascular glaucoma secondary to vein occlusion. A total of n=20 were males and n=10 cases were female cases. The male-to-female ratio was 2: 1. The right eye was most commonly involved in 60% of the cases depicted in figure 2.

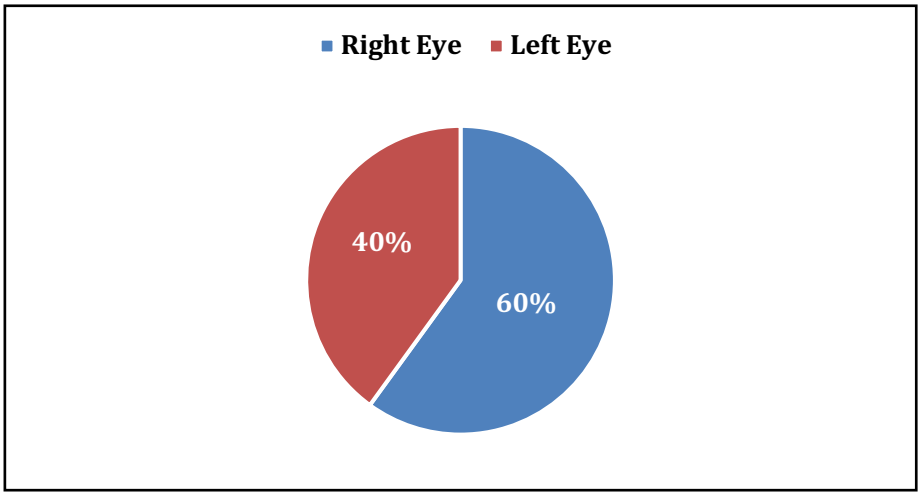

Figure 2: Laterality of involvement of eyes in the cases of the study

Table 1: Showing the etiology of Glaucoma in our study

Causes	Frequency	Percentage
Proliferative Diabetic Retinopathy	14	46.67
Central retinal vein occlusion CRVO	8	26.67
Recurrent anterior uveitis	2	06.67
Hypertension	2	06.67
Others	4	13.33
Total	30	100.0

Proliferative Diabetic Retinopathy (PDR) accounted for 46.67% of cases, CRVO 26.67%, recurrent anterior uveitis, and hypertension 6.67% each. Other causes included 13.33% included post-traumatic, and postsurgical. Nowadays, a post-traumatic cause emerges significant in developing Neovascular glaucoma details depicted in table 1.

Table 2: Pre-treatment Intra Ocular Pressure (IOP) in the cases of the study

IOP (mmHg)	Group I Trabeculectomy with MMC	Group II Trabeculectomy with Ologen	Group III Drainage Implant Surgery
31 – 40	3	3	3
41 – 50	5	3	4
51 – 60	2	2	2
> 61 above	0	2	1

The mean pre-treatment IOP in Group I was 46.58 ± 8.44 mmHg the range was 32.25 to 59.74 mmHg. Similarly, in Group II the range of pre-treatment IOP was from 32.68 to 62.35 mmHg, and the mean value of IOP was 43.22 ± 9.60 mmHg and in group III the range of IOP was from 34.19 to 62.30 mmHg and the mean pre-treatment IOP was 47.21 ± 4.21 mmHg.

Table 3: Mean intraocular pressure post-treatment in different groups of the study

Group	Pre-Treatment	Mean Intra-Ocular Pressure [IOP] post-treatment		
		First Week	Second Week	Third Week
I	46.58 ± 8.44	19.92 ± 9.37	17.55 ± 8.12	17.11 ± 7.33
II	43.22 ± 9.60	25.54 ± 5.98	21.21 ± 7.38	19.25 ± 5.17
III	47.21 ± 4.21	20.19 ± 6.24	18.05 ± 7.12	21.47 ± 5.03

Mean IOP reductions were 27.5 mmHg in Group I, 26.8 mmHg in Group II, and 23.15 mmHg in Group III. A maximum weekly mean IOP decrease was observed in group II. After 12 weeks, there was no statistically significant difference between these three groups' mean IOP reductions. Preoperative visual acuity for the majority of patients ranged from PL to 1/60. In Group II, N=3 patients had improved eyesight. After surgery, the majority of the patients experienced decreased eyesight. These various treatment techniques focus on lowering mean IOP rather than improving eyesight. Improvement in eyesight was not statistically significant (table 3). N=4(40%) of the patients in Group I had shallow anterior chambers. Five patients (50%) suffered problems from blebs, including bleb leak, blebitis, avascular, and overhanging bleb. Ocular hypotony was present in one subject (10%). One patient (10%) experienced hyphema. All of these problems were successfully treated and controlled. Group, I had a higher rate of postoperative complications. In Group II, postoperative problems were barely noticeable. Only 2

individuals experienced minor iritis after surgery. Topical medicine helped to manage this. Five individuals had discomfort right after surgery. The analgesic medication helped to alleviate the complication.

About 20% of patients in Group III had shallow anterior chambers when they were first post-operatively evaluated. This indicates an anterior chamber leak or excessive aqueous outflow. This problem is more frequent in drainage devices without valves. A longer-lasting pressure patch allowed the anterior chamber to reform (10 days). Hyphema is a well-known side effect of neovascular glaucoma surgery. The primary cause of this is intraoperative hemorrhage. One patient experienced just minor postoperative iritis. Drugs used topically helped to treat the condition.

Discussion

This study was done on cases of neovascular glaucoma treated with different modalities of treatment presented to our tertiary care teaching Hospital. The mean age of the study group was 55.5 ± 8.5 years. In a study by GB Rodrigues et al., [7] in their review have shown that prevalence was maximum in the> 60 years age group. In the current study, males were more commonly affected as compared to females. Previous studies have also shown a slight male preponderance, but it was not statistically significant. [7-9] In this study right eye was commonly involved as compared to the left eye. Previous studies have shown no significant preponderance regarding the eye involved. [8, 9] In our study, a maximum number of 70% had an IOP range of 30-50mmHg suggesting the severity of the disease. Previous studies have also shown a high IOP at the time of presentation. [10] Our analysis revealed that diabetic retinopathy (46.67%) and vascular occlusion (26.67%) were the two most frequent aetiologies, indicating that retinal ischemia was the primary contributor to neovascular glaucoma. Additionally, previous research has demonstrated that the main contributing causes of Neovascular glaucoma include diabetic retinopathy and vascular ischemia episodes. [11, 12] Each patient underwent a thorough evaluation to determine the cause of neovascular glaucoma, and cases were then post-operatively monitored for 12 weeks. The majority of the patients had a subpar vision, with a range of PL to 1/60. The majority of patients fell between 41 and 50 mmHg, and the mean IOP was 46.16 mmHg. In this study, n=10 patients were randomly assigned to one of three treatment groups: trabeculectomy with mitomycin C (Group I), trabeculectomy with Ologen implant (Group II), or glaucoma drainage device surgery. There was a significant reduction in IOP between the 3 groups in the follow-up period with a mean reduction of 27.5 mmHg in Group I, 26.8 mmHg in Group II, and 23.15 mmHg in Group III respectively. The maximum mean reduction of IOP in the first week was seen in group III. At the end of 12 weeks of follow-up, there was no statistically gross difference in the reduction of IOP between the 3 groups. There was no statistically significant improvement in vision in any of the 3 groups. In group II, postoperative complications were barely noticeable. Only 3 individuals experienced minor postoperative iritis. In group III, there is acute postoperative discomfort, a shallow anterior chamber, minor iritis, hyphema, and pain. The majority of patients with Neovascular glaucoma experience intraoperative hemorrhage. One incidence of tube contact with the cornea was documented. This can be the result of the tube being misdirected during surgery. [13]

Conclusion

Neovascular glaucoma presents more commonly in advanced ages and is more commonly affected in males. In the first week, patients treated with Trab and glaucoma implants had a lower IOP than

the other two groups, but after 12 weeks, the mean IOP decrease was the same in all three groups. Compared to the other 2 Groups, patients treated with Trab with ologen Implants experienced the fewest post-operative complications. It is important to educate general practitioners who treat patients with diabetes and hypertension about glaucoma. As a result, they refer patients to ophthalmologists earlier, greatly reducing the risk of the neovascular glaucoma condition.

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