COMPARATIVE STUDY OF DIFFERENT MODALITIES OF TREATMENT IN NEOVASCULAR GLAUCOMA

Devi Govindarajan[1], Kalaiselvi Balasubramanian[2]

[1]Assistant Professor, Department of Ophthalmology, Government Medical College, Omandurar Government Estate, Chennai, Tamil Nadu.
[2]Associate Professor, Department of Ophthalmology, Government Medical College, Omandurar Government Estate, Chennai, Tamil Nadu.

ABSTRACT

BACKGROUND

Neovascular Glaucoma is a secondary type of glaucoma caused by a fibro vascular membrane which develops on the surface of iris and the angle. It never occurs as a primary condition, but it is always associated with other abnormalities mostly ischemia.

The objectives of the study were- 1. to compare the effect of trabeculectomy with Mitomycin C / ologen implant / glaucoma drainage device surgery in neovascular glaucoma patients. 2. to identify the best method of treatment and 3. to assess the control of intraocular pressure, visual outcome and post-operative complications.

MATERIALS AND METHODS

27 Neovascular glaucoma patients attending Department of Ophthalmology, Government Medical College, Omandurar Government Estate, Chennai were evaluated in detail. Of these, randomly 10 patients were treated with Trabeculectomy with Mitomycin C, 10 patients were treated with Trabeculectomy with Ologen implant, 5 patients were treated with Glaucoma drainage device implant surgery. Out of 27 patients 2 patients didn't turn up for surgery. The control of intraocular pressure, visual outcome, post-operative complications were assessed and compared.

RESULTS

In this study, out of 25 patients, the mean pre-treatment intra ocular pressure was 45.76 mmHg. Maximum mean reduction of IOP in the first week was seen in group III (drainage implant surgery). But at the end of 12 weeks, all three groups showed statistically significant reduction of mean IOP. There is no significant gross difference between these groups at the end of 12 weeks.

CONCLUSION

Group I -Trabeculectomy with Mitomycin-C showed more complications compared to other 2 groups; shallow anterior chamber and bleb related complications were more common in group I. Earlier presentation and management of these patients would reduce the dreaded complications of neovascular glaucoma.

KEYWORDS

Mitomycin – C, Ologen, Glaucoma Implant.

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BACKGROUND

Glaucoma is a chronic progressive optic neuropathy caused by a group of ocular pathology which lead to characteristic changes in the structure of the optic nerve head, functional visual changes and characteristic corresponding field changes. The most common risk factor is raised intra ocular pressure.

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Corresponding Author:
Dr. Kalaiselvi,
Plat No. 46, Radha Nagar,
2nd St., Valasaravakkam,
Chennai- 87, Tamil Nadu.
E-mail: kalai69.ks@gmail.com
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Neovascular Glaucoma

Secondary type of glaucoma is caused by a fibro vascular membrane that develops on surface of iris and the angle. Neovascular glaucoma never occurs as a primary condition but it is always associated with other abnormalities mostly ischemia.[1]

Clinical Course

Pre-Rubeosis Stage

Predisposing factors such as diabetic retinopathy/CRVO. Treatment may be induced before rubeosis is detected.

Pre-Glaucoma Stage: Rubeosis Iridis

Characterised by normal IOP unless pre-existing chronic open angle glaucoma is present. SLE - dilated tufts of pre-existing capillaries and fine randomly oriented vessels on surface of the iris near the pupillary margin. Most commonly first seen in peri pupillary region. In CRVO and diabetic

retinopathy it may be first seen in the angle.[2,3] Histology - New vessels are characterised by having thin fenestrated walls, arranged in irregular pattern.

Open Angle Glaucoma Stage

All rubeosis does not lead to NVG, they may resolve spontaneously. Incidence of NVG in diabetic patients with rubeosis iridis is 13-41%. In vascular occlusive disease this occurs typically after 8-15 months. This called as 90-day glaucoma. On SLE- AC reaction, sometimes hyphaemia is seen. Gonioscopy- angle open and neovascularisation intense. IOP–elevated. HPE- fibro vascular membrane covers the angle, anterior surface of iris and even extend into posterior surface.

Angle Closure Glaucoma Stage

SLE- Iris stroma smooth, glistening and flattened. Ectropion uveae is frequently seen. Gonioscopy – angle- PAS formation with eventually total synechiae present.

5-Fluorouracil and mitomycin**-**C are used as pharmacological modulators in neovascular glaucoma. It prevents impending bleb failure, and to reduce the vascularisation of bleb. It increases the success rate (60% to 90%) in eye that are at risk of failure.[4]

Ologen is a biodegradable (90-180 days) collagen implant-porous matrix of cross linked atelocollagen and glycosaminoglycans.

Mechanism

Modulation of wound healing. Reorganisation of newly formed fibroblast and adjacent extracellular substances. Acts as a spacer between conjunctiva and sclera maintaining the patency of subconjunctival space. It is placed directly over the scleral flap and it influences the healing process.

Valve Implant Surgery

One of the major problems in neovascular glaucoma is failure of filtration bleb. Synthetic devices are used in glaucoma surgery to maintain a patent drainage fistula.

Aims and Objectives

1. To compare the effect of trabeculectomy with Mitomycin C / ologen implant / Glaucoma drainage device surgery in neovascular glaucoma patients.
2. To identify the best method of treatment and to assess the control of intraocular pressure, visual outcome and post-operative complications.

Inclusion Criteria

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

Exclusion Criteria

- Patients with primary glaucoma.
- Patients with dilated vessels alone in iris without evidence of new vessels.
- Patients with other type of secondary glaucoma.

MATERIALS AND METHODS

This prospective study was conducted on 27 Patients attending Department of Ophthalmology, Government Medical College, Omandurar Government Estate, Chennai. Neovascular glaucoma patients were evaluated in terms of detailed history, A thorough evaluation which included general, systemic examination was performed. Complete ocular examination of visual acuity recording by Snellen's chart, slit lamp biomicroscopy examination, fundus examination by indirect ophthalmoscopy, gonioscopy with Goldmann 3 mirror gonio lens, tension by applanation tonometry, automated perimetry (if possible) was done. FFA – to evaluate new vessels and large areas of capillary non-perfusion. B Scan Ultrasound – Revealing occult malignancy presenting as NVG and shown to be considered for all cases in which the cause of anterior neovascularisation is unclear, and fundus cannot be visualized.

Medical treatment was started for all cases. Out of 27, 2 patients didn't turn up for surgery. 25 patients were randomly divided into 3 groups for each method of treatment .10 patients were treated with Trabeculectomy with MitomycinC.[5]

Dose

Sponge soaked in 0.2 mg/ml. Duration 2-4 min. 10 patients were treated with Trabeculectomy with Ologen implant.[6] 5 patients were treated with Glaucoma drainage device implant surgery (Keiki Mehta valve – Regular size)[7,8] 25 patients were re- examined first post-operative day and then end of first week, 6 week and 12 weeks. At each visit anterior segment examination by slit lamp biomicroscopy, Tonometry, visual acuity recording, fundus examination were done. The control of intraocular pressure, visual outcome, post-operative complications were assessed. Effect of different methods of treatment compared and best method of treatment was found out. The data were analysed, and the results were obtained.

RESULTS

In this study of 27 patients At most cases had corneal and iris involvement with new vessels extending into the angle with or without synechial angle closure. Out of 27 patients 2 patients didn't turn up for surgery. In these 25 patients Mean age of presentation was 59.04 years. (Range 41-70 years, S.D. = 5.72). The male to female ratio was 2.5:1 which shows that there was male preponderance of neovascular glaucoma in this study. The right eye was affected more (64%) than the left (36%). Most of the patients secondary to CRVO presented within 6 months which may be due to rapid development of neovascularisation process. 28% of diabetes presented after a year. This relatively late

presentation may be due to less virulent nature of new vessels.

Mean pre-treatment IOP was 45.76 mmHg (Range 34 to 69 S.D. 10.70). The mean pre-treatment IOP in Group I was 47.36 mmHg (S.D. 8.89 S.E. 2.82).[9] In Group II was 43.7 mmHg (S.D. 10.88 S.E. 3.43) and in Group III was 46.72 mmHg (S.D. 14.98 S.E. 6.83). There was no statistically significant difference in the mean IOP between the 3 groups. Unpaired T-test was undergone. Probability of Group I<0.0001, Group II<0.0006 and Group III < 0.0033. There was statistically significant reduction of IOP in all three groups in the follow up period.

Mean IOP reduction in Group I was 28.3, Group II was 26.3, whereas in Group III was 26.38. Maximum mean reduction of IOP in 1 week seen in group II. At the end of 12 weeks there was no statistically gross difference in reduction of mean IOP in these three groups. Most of the patients had poor visual acuity ranging from PL to 1/60 preoperatively. Only 2 patient showed improvement of vision in Group II. Most of the patients had diminished vision post operatively. These different modalities of treatment concentrate to reduction in mean IOP not on the vision. Statistically improvement of vision was not significant.

In Group I – 5 (50%) patients had shallow anterior chamber. 8 (80%) patients had bleb related complications like bleb leak (3), blebitis (1), avascular bleb (1), elevated bleb (1), cystic bleb (1), overhanging bleb (1). One (10%) patient had ocular hypotony. One (10%) patient had hyphema. All these complications were effectively managed by appropriate treatment. Post-operative complications were more in Group I.[10]

Post-operative complications were minimal in Group II. Only 2 patients developed post-operative mild iritis. This was controlled by topical medication. Five patients had pain in immediate post-operative period. This was relieved by analgesic drugs.

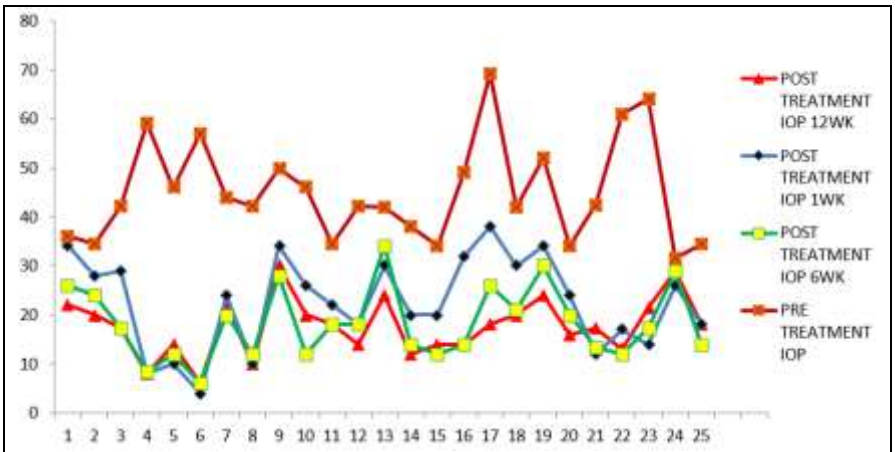
In Group III Shallow anterior chamber was found in 20% of patients in the early post-operative period.[11] This reflects excessive drainage of aqueous or leak in anterior chamber. This complication is more common in valve less drainage device. Reformation of the anterior chamber was achieved with a pressure patch for a longer time (10 days). Hyphema is a well-recognized complication in surgery for neovascular glaucoma.[12] This is mainly due to intra operative bleeding. This was found in 20% of patients in early post-operative period. The cause of tube contact with cornea in one case was due to misdirection of the tube. Proper scleral tunnelling will prevent this type of complication. One patient had minimal post-operative iritis. This was managed by topical medication. Four patients had pain in immediate post-operative period.

IOP (mmHg)	Group I Trabeculectomy with MMC	Group II Trabeculectomy with ologen	Group III Drainage Implant Surgery
31-40	2	4	2
41-50	5	4	1
51-60	3	1	1
61 & above	-	1	1

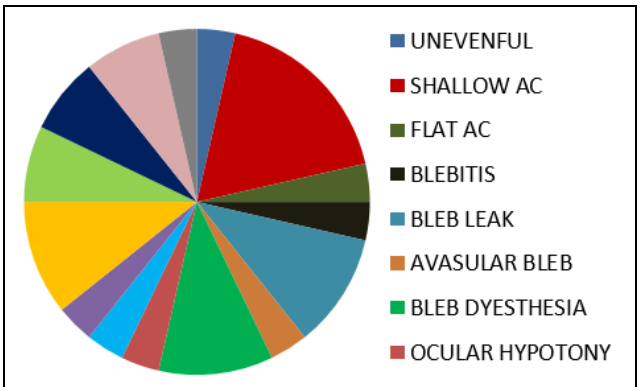
Table 1. Pre-Treatment Intraocular Pressure

Group	Pre-Treatment	Mean IOP ± S.D.(mmHg) Post Treatment		
		1 Week	6 Week	12 Week
I	47.36±8.89	20.7±11.47	16.58±7.64	16.93±7.43
II	43.7±10.88	26.8±6.87	20.7±7.24	17.4±4.22
III	46.72±14.98	17.4±5.36	17.14±6.9	20.34±5.23

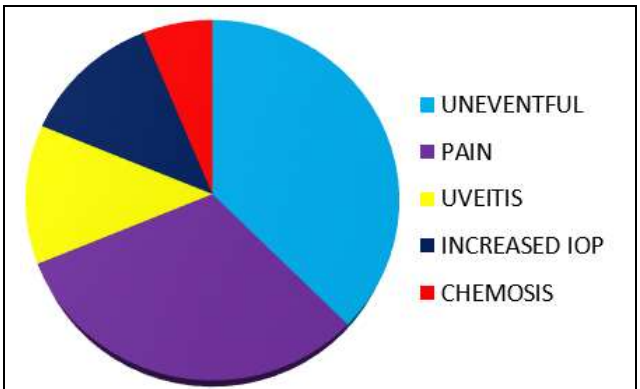
Table 2. Intra Ocular Pressure



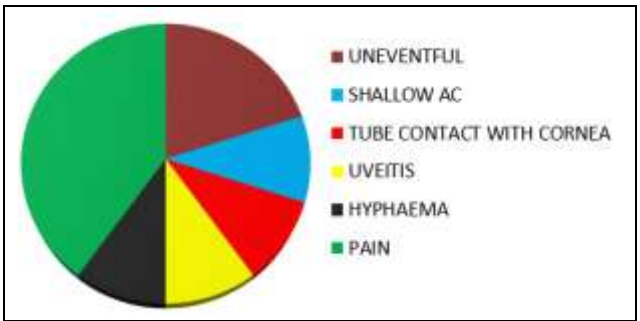
Graph 1



Graph 2. Post-Operative Complication (Group I)



Graph 3. Post-Operative Complication (Group II)



Graph 4. Post-Operative Complication (Group III)

DISCUSSION

This study was conducted in twenty-five established cases of Neovascular glaucoma between June 2017- December 2018.

In all cases, detailed examination was done to find out the aetiology of neovascular glaucoma and cases were post operatively followed up for a duration of 12 weeks.

Most of the patients had poor visual acuity ranging from PL to 1/60.

The mean IOP was 45.76 mmHg and majority of cases were in the range of 41- 50 mmHg.

In this study randomly 10 cases were subjected into Trabeculectomy with Mitomycin C (Group I), 10 cases subjected into Trabeculectomy with Ologen implant (Group II), 5 cases underwent Glaucoma drainage device surgery.

There was a significant reduction in IOP between 3 groups in the follow up period with mean reduction of 28.73, 26.3 and 26.38 in Group I, Group II and Group III respectively. Maximum mean reduction of IOP in the first week seen in group III (29.32 mean IOP reduction). At the end of 12 weeks of follow up there was no statistically gross different in reduction of IOP between 3 groups.

There was no statistically significant improvement of vision in any of the 3 groups.

Post-operative complications more in group I (Trabeculectomy with Mitomycin C) shallow anterior chamber was seen in 5 (50%) of the patients. Flat anterior chamber was seen in 1 patient. Bleb related complications like bleb leak (3), blebitis (1) bleb dysesthesia (3), cystic bleb 1, overhanging bleb 1, elevated bleb 1) due to the adverse effect of mitomycin drug. Ocular hypotony was reported in 1 case. Pain, dry eye, foreign body sensation, blinking problem, chemosis like problems also reported in group I.[13]

Post-operative complication was minimal in group II. Only 2 patients were developed post-operative minimal iritis. In group III, shallow anterior chamber (1), minimal iritis (1), hyphema (1), pain (4) present in immediate post-operative period. Intra operative bleeding is most common in Neovascular glaucoma patients. Tube contact with cornea reported in 1 case. This may be due to misdirection of the tube while surgery.[14]

CONCLUSION

Out of 25 patients of neovascular glaucoma in our study, the major aetiological factors were proliferative diabetic retinopathy, central retinal vein occlusion, recurrent anterior uveitis.

Out of these 3 groups, reduction in IOP was seen in patients treated with trab with glaucoma implants compared to the other 2 groups in the first week but at the end of 12 weeks the Mean Reduction in IOP was the same in all 3 groups. Post-Operative complications were minimal in patients treated with Trab with ologen Implants compared to the other 2 Groups.

Neovascular glaucoma secondary to Central Retinal Vein Occlusion presented earlier than proliferation diabetic retinopathy which presented relatively later. Patients with CRVO and uncontrolled diabetic patients came to the ophthalmic surgeon or referred by a general practitioner only when the patient develops painful eye with diabetic retinopathy.

Awareness about glaucoma should be created among the general physicians treating the diabetic and hypertensive patients. So, they refer the patients earlier to ophthalmologist which would considerably reduce the dreaded complication of neovascular glaucoma.

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