ETIOLOGICAL PROFILE OF NEOVASCULAR GLAUCOMA AT A TERTIARY LEVEL HOSPITAL

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ABSTRACT

BACKGROUND

Neovascular glaucoma is a potentially blinding secondary glaucoma without pupillary block. It is associated with severe, diffuse and chronic retinal ischemia. Prevention and treatment of neovascular glaucoma early in its course is important as neovascular glaucoma carries a very guarded prognosis.

The objective of the study is to find out the common aetiological factors of neovascular glaucoma in a tertiary level hospital in southern part of Kerala.

MATERIALS AND METHODS

This is a descriptive study of 66 cases of neovascular glaucoma which attended a tertiary level hospital in southern part of Kerala. The aetiological factors and clinical presentation of various cases of neovascular glaucoma has been analysed. Information extracted from the patients with particular reference to diabetes mellitus, hypertension, cardiovascular disease, uveitis, glaucoma, trauma and recent onset defective vision were elicited.

RESULTS

From the study, it was found that proliferative diabetic retinopathy is the most common cause of neovascular glaucoma (35.7%), central retinal vein occlusion stands second (30%) and unknown causes (11.4%) stand third. Other causes of neovascular glaucoma seen in the study were chronic uveitis (10%), ocular ischemic syndrome (4.3%), central retinal artery occlusion (2.9%), branch retinal vein occlusion (2.9%), Coats' disease (1.4%) and post radiotherapy (1.4%).

CONCLUSION

Neovascular glaucoma was found to be an important cause of secondary glaucoma. Visual acuity at presentation was no perception of light in majority of cases with gonioscopy showing closed angle. Diabetes mellitus and hypertension has strong association with neovascular glaucoma. Most common causes of neovascular glaucoma are proliferative diabetic retinopathy and central retinal vein occlusion. Less frequent causes are chronic uveitis, ocular ischemic syndrome, central retinal artery occlusion, branch retinal vein occlusion, Coats disease and post radiotherapy. Early detection of cases which can progress to neovascular glaucoma is important as neovascular glaucoma is intractable, once the angle gets closed with fibro vascular membrane.

KEYWORDS

Neovascular glaucoma, ischemic retina, Proliferative diabetic retinopathy, Central retinal vein occlusion.

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BACKGROUND

Neovascular glaucoma is a relatively common and extremely serious condition which results in severe visual impairment. Vasoproliferative factors VEGF (vascular endothelial growth factor), produced by hypoxic retinal tissue causes proliferation of new vessel from existing vessels at the pupillary border resulting in neovascularisation of iris (NVI) or at the angle (resulting in neovascularisation of angle (NVA). The symptoms of neovascular glaucoma are distressing the visual loss severe and glaucoma intractable. Until 1963, the condition was known mostly as 'hemorrhagic glaucoma', based on the occasional association with hyphaema; the term 'neovascular glaucoma' was proposed by Weiss and coworkers, and because this term better fits with the pathophysiology of the condition, it has become the accepted one.[1]

Treatment should be initiated before the anterior chamber angle is closed by peripheral anterior synechiae caused by the fibrovascular membrane.

Relatively frequent causes of neovascular glaucoma include the following:

1. Central retinal vein occlusion.
2. Proliferative diabetic retinopathy.
3. Carotid artery occlusive disease.

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Less frequent causes of neovascular glaucoma include the following:

1. Branch retinal vein occlusion.
2. Central retinal artery occlusion.
3. Intraocular tumours.
4. Chronic retinal detachment.
5. Secondary to intraocular lens (Uveitis-glaucoma-hyphaema (UGH) syndrome).
6. Chronic or severe ocular inflammation.
7. Endophthalmitis.
8. Sickle cell retinopathy.
9. Retinopathy of prematurity.
10. Radiation retinopathy.
11. Eales disease.
12. Coats disease.
13. Carotid cavernous fistula.
14. Carotid ischemic syndrome carotid insufficiency.
15. Takayasu disease.
16. Giant cell arteritis.
17. Anterior segment ischemia (i.e., previous extra ocular muscle surgery).
18. Trauma.
19. Syphilitic retinal vasculitis.
20. Retinoschisis.
21. Sticklers syndrome (inherited vitreoretinal degeneration).
22. Metastatic intraocular malignant lymphoma.[2]

Neovascular glaucoma can develop in 1–17% of diabetic eyes and in 33-64% of eyes with proliferative diabetic retinopathy. Diabetic retinopathy is a leading cause of blindness in persons aged 20 to 74 years. Central retinal vein occlusion (CRVO) is another common cause of neovascular glaucoma. It is estimated that 30% of patients who suffer a central retinal vein occlusion develop neovascular glaucoma. Recent investigations have shown that 58–86% of the eyes with ischaemic vein occlusion develop neovascular glaucoma while it occurs in 0–4% of eyes with non-ischaemic CRVO. Neovascular glaucoma usually presents about 3 months after CRVO and thus has been called 100-day glaucoma. In patients with CRVO, studies have shown that a relative afferent pupillary defect indicates an increased risk of developing rubeosis iridis.[3] An undilated slit-lamp examination and gonioscopy are essential for the detection of NVI and NVA, respectively. The Central Vein Occlusion Study (CVOS) revealed that approximately 10% of eyes with nonischaemic CRVO and 6% of eyes with ischaemic CRVO developed NVA without signs of iris neovascularisation.[4]

Carotid artery occlusive disease (CAOD) is the third most common cause of neovascular glaucoma accounting for at least 13% of the cases. Ocular ischemic syndrome occurs in the presence of more than 90% of patients with carotid artery stenosis, but it can occur as a result of aortic arch disease (e.g. syphilis, Takayasu arteritis, dissecting aneurysm), in which case the presentation may be bilateral. Following a major branch vein occlusion visual acuity is initially reduced due to haemorrhage and macular oedema. However, within 6 months about 50% of eyes develop efficient collaterals with a return of visual acuity to 6/12 or better. Neovascular glaucoma following occlusion of central retinal artery is distinctly uncommon 3.8%. There is 20% chance of developing new vessels after CRAO. In majority of cases rise in tension has occurred between 5 and 9 weeks after the arterial occlusion a considerably shorter interval than that of glaucoma which follow CRVO. Usually retinal detachment is associated with hypotony but secondary glaucoma occurs in a small proportion of cases. Persistent retinal detachment has an essential role in development of rubeosis iridis. Intraocular tumours cause neovascular glaucoma due to formation of vascularised membrane on iris. Common intraocular tumor causing neovascular glaucoma are malignant melanoma and retinoblastoma. Ultrasound and further radiological investigations may be necessary to diagnose choroidal melanoma which should be suspected in all eyes having NVI and a chronic retinal detachment.[5]

Radiation retinopathy is highest in radiation of eye and orbit (85.7%) paranasal sinus (45%) risk of retinopathy increases significantly when total dose of radiation exceeds 3000 c Gy.

Neovascular glaucoma often presents with pain, watering, redness and blurred vision. The intra ocular pressure may be as high as 60 mm of Hg with conjunctival congestion and steamy cornea along with new vessels on the iris and ectropion uvea and variable degrees of synechial angle closure.

Aim of the Study

The aim of this study was to find out the common aetiology of neovascular glaucoma in patients attending a tertiary level hospital.

MATERIALS AND METHODS

This is a descriptive study of 66 cases of neovascular glaucoma attending a tertiary level hospital in southern part of Kerala during the study period of 8 months, and those who had given the consent for participating in the study. Information extracted from the patients include bio-data, history of presenting complaints, past history of patients with particular reference to diabetes mellitus, hypertension, cardiovascular disease, history of chronic steroid intake, uveitis, glaucoma, trauma and history of recent onset of defective vision were elicited. The etiological factors and clinical presentation of various cases of neovascular glaucoma has been analysed. Both eyes were examined in detail with particular reference to vision, refraction, slit lamp, biomicroscopy, fundus examination, IOP and gonioscopy. B scan and field charting was done in relevant cases.

Inclusion Criteria

All cases diagnosed to have neovascular glaucoma and given consent for participating in the study.

RESULTS

Based on Age Distribution

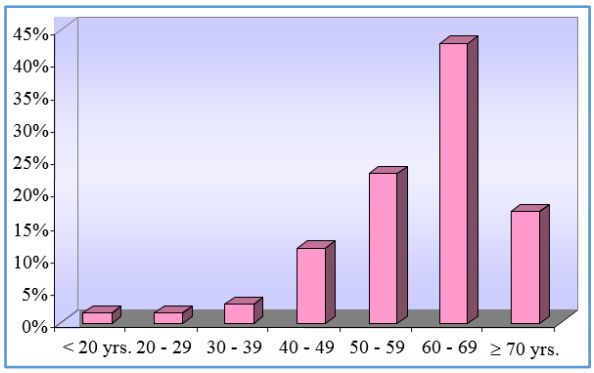

Figure 1. Age Distribution

In the present study, majority of cases (42.9%) belong to the age group of 60-69 years.

Distribution based on Vision of Affected Eye

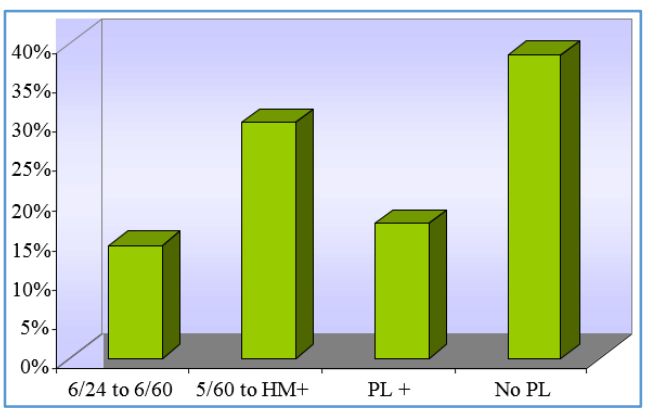

Figure 2. Distribution based on Vision of Affected Eye

At presentation, 38.6% cases had no light perception and 17.1% had only perception of light. 14.3% had >6/60 vision.

Gonioscopy Finding

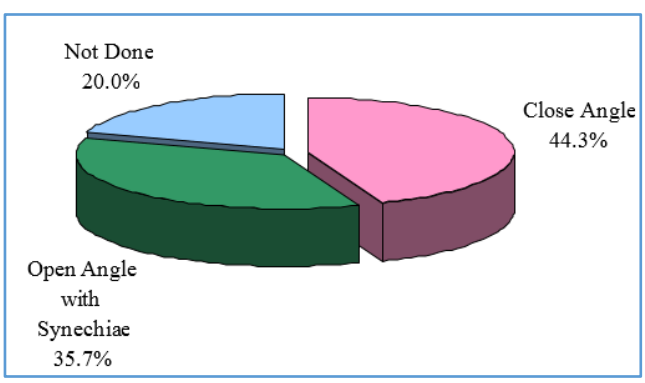

Figure 3. Gonioscopy Involved

Gonioscopy showed 44.3% cases have closed angle and 35.7% open angle with synechiae.

Distribution based on Systemic Diseases

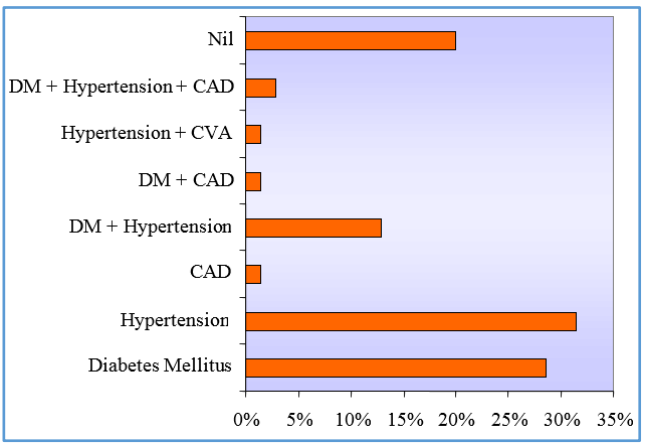

Figure 4. Distribution based on Systemic Diseases

In the present study, 31.4% had hypertension alone; cases presented with diabetes mellitus alone was 28.6%. 12.9% had both hypertension and diabetes mellitus.

Distribution based on Causes of Neovascular Glaucoma

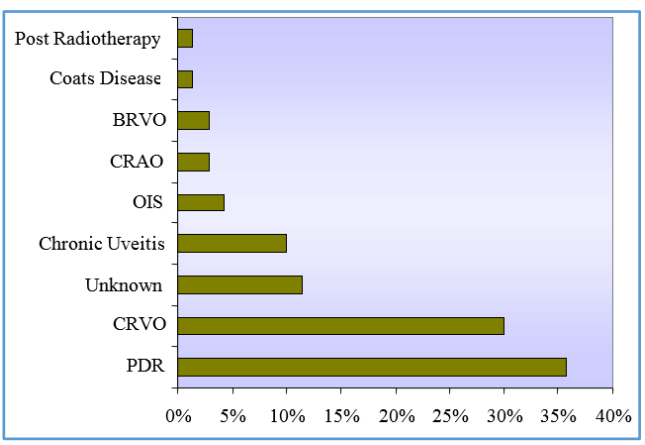

Figure 5. Distribution based on Causes of Neovascular Glaucoma

PDR is the most common cause of neovascular glaucoma (35.7%); CRVO stands second (30.0%) and unknown causes (11.4%) stand third. Other causes of neovascular glaucoma seen in this study were chronic uveitis (10.0%); ocular ischaemic syndrome (4.3%); CRAO (2.9%); BRVO (2.9%); Coats disease (1.4%) and post radio therapy (1.4%).

DISCUSSION

Neovascular glaucoma is a disastrous type of glaucoma which usually occur secondary to retinal vascular diseases. Among 66 cases of neovascular glaucoma studied, 4 cases had bilateral neovascular glaucoma, both eyes of those cases where included in the study and so 70 eyes were studied. Overall, gender incidence was 60% males and 40% females. Males are more in number than females. Maximum cases were in the age group of 60-69 years and this shows that neovascular glaucoma is a disease of old age. This is

due to the fact that complications of hypertension, diabetes mellitus and atherosclerosis like PDR, CRVO, OIS, CRAO, etc. appear in the older age group. Only one case was in the teen and that was due to Coats disease. A significant ($p < 0.001$) relationship exists between age and cause of neovascular glaucoma. Generally, a higher age showed high prevalence of neovascular glaucoma, of which PDR and CRVO was maximum in 60-69 age group and chronic uveitis was found maximum in ≥70 years age group. Similarly, higher age group developed neovascular glaucoma due to unknown reasons also. Age at time of development of neovascular glaucoma was lower in PDR than those with retinal venous obstruction. This result is comparable with the study of Al-Shamsi et al.[6]

All patients presented with acute onset of pain, redness and watering from the eye due to increase in intraocular pressure. They had circumcorneal congestion, corneal oedema and new vessels on iris. In 38.6% of patients, vision was reduced to no perception of light. In 17.1% vision was just perception of light. Maximum visual acuity noted was 6/36 in two patients. At the time of admission IOP was unrecordably high in 7 patients. In the present study, diabetes mellitus was found to be the leading cause of neovascular glaucoma (35.7%). This result agrees with the study conducted by Al-Shamsi et al.[6] where PDR was the most common primary factor predisposing to the development of neovascular glaucoma and accounted for 56.06% of the cases. The present study also agrees with the study conducted by Tung-Mei Kuang et al.[7] which showed that out of 35 patients studied the underlying cause was diabetes mellitus in 29 patients. In the study conducted by Hayreh SS,[8] the most common disease responsible for development of neovascular glaucoma are ischaemic central vein occlusion, diabetic retinopathy and ocular ischemic syndrome. Diabetic retinopathy is a leading cause of blindness in persons aged 20-74 years. 33-64% eyes with untreated PDR develop ocular neovascularisation. With improved treatment available for diabetes, life expectancy has been greatly increased resulting in many more individuals with diabetic retinopathy. Education of both patients and primary care providers can help to address the important challenge

In the present study, next common cause was CRVO (30%). Out of the 21 neovascular glaucoma patients due to CRVO associated POAG was seen in 3 patients. Other patients with CRVO were found to have hypertension. Essential hypertension and POAG remain the principle etiological factor in the pathogenesis of CRVO. Almost two-third cases in this study were due to PDR and CRVO. So PDR and CRVO form the leading causes of neovascular glaucoma. In the present study, in 11.4%, the underlying cause remains obscure. Out of 8 patients, 5 were hypertensive. Majority had no PL at presentation. Due to media opacities fundus was not seen. B scan showed no posterior segment pathology. Since 5 patients were hypertensive and hypertension exacerbates the ocular condition like diabetic retinopathy and predisposes to development of retinal vein occlusion which later on leads to neovascular glaucoma. The probable cause could be CRVO. Next common cause was chronic uveitis (10%). Indeed, almost all cases of neovascular glaucoma had prominent flare in anterior chamber probably due to leakage of serum products from new vessels and occasionally this response may be confused with iritis. Two cases in the present study had ocular ischemic syndrome; one had bilateral neovascular glaucoma.

Four cases in this study had bilateral neovascular glaucoma of which 3 were due to diabetic retinopathy suggesting that the presence of bilateral neovascular glaucoma strongly indicates diabetic retinopathy as the primary underlying cause. This is in accordance with the study done by Brown et al.[9] In the present study, two patients had neovascular glaucoma due to CRAO. One patient had associated coronary artery disease, other patient was hypertensive. Both patients had degeneration of ocular fundus. The retinal manifestations included mid peripheral haemorrhage and dilated retinal veins. Neovascularisation was observed in the iris and anterior chamber. Two patients in the study were due to BRVO. Both of them had hypertension. Neovascularisation occurs in about 30-50% of eyes with significant areas of capillary non-perfusion after a main BRVO.[10] Other causes found were Coats disease and post radiotherapy.

CONCLUSION

Present study shows that neovascular glaucoma is an important cause of secondary glaucoma. In the study group, visual acuity of patients at presentation was 'no perception of light' in majority of cases with gonioscopy showing closed angle. Diabetes mellitus and hypertension has strong association with neovascular glaucoma. In the present study, proliferative diabetic retinopathy (35.7%) is the most common cause of neovascular glaucoma. Next prevalent cause of neovascular glaucoma was central retinal vein occlusion (30%). In 11.4% of cases, the cause could not be attributed to any specific reason. Many of them might be due to central retinal vein occlusion because of the presence of hypertension or arteriosclerotic changes in the fellow eye which were shown to be the predisposing factors for central retinal vein occlusion. Chronic uveitis (10%) was yet another cause for neovascular glaucoma. Ocular ischemic syndrome (4.3%), central retinal artery occlusion (2.9%), branch retinal vein occlusion (2.9%), Coats' disease (1.4%) and post radiotherapy (1.4%) were also found to be underlying causes for neovascular glaucoma in the present study. The ultimate treatment of neovascular glaucoma would be to prevent the initiating events such as diabetic retinopathy and CRVO, or to prevent that event from progressing to neovascular glaucoma. Panretinal photocoagulation and intravitreal anti-VEGF therapy can reduce this progression in part, but may not produce consistent results.

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