ORIGINAL ARTICLE

To Study The Relationship Between The Axial Length of The Eye Ball and the Retinal Vein Occlusion

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Abstract

The study was conducted on 50 patients attending the Eye OPDs of Ophthalmology Department of Government Medical College Jammu during the year. 25 patients were clinically diagnosed to have Retinal Vein Occlusion and were compared with 25 age and sex matched controls. The axial lengths of both eyes of all 50 patients were measured using A-Scan Biometry, the data was analyzed by student t-test and chi-square test.It was concluded that the axial lengths in retinal vein occlusion were significantly shorter than the controls. This significant difference can be a risk factor in the development of retinal vein occlusion.

Key Words

Retinal Vein Occlusion, Axial Lengths, Eye Ball

Introduction

Retinal vein occlusion is the most common retinal vascular occlusive disorder and is associated with a variable amount of loss of vision. It is the second most common retinal vasculopathy after diabetic retinopathy (1). Early recognition and treatment is important to avoid potentially significant visual morbidity.

Retinal Vein Occlusion is multifactorial in origin and usually no single factor on its own causes the occlusion. Basically there are three groups of disorders which will cause Retinal Vein Occlusion.

i). Diseases of blood and blood constituents causing primary thrombosis.

ii). Diseases of vessel wall such as vasculitis of vessels, e.g. Eales' disease, Sarcoidosis, Lyme's disease, Behcets disease and Uveitis etc.

iii). Diseases with rise in intra-ocular pressure as Chronic simple glaucoma.

It is generally accepted that close proximity of the central retinal artery and vein in the region of lamina cribrosa and their common adventitial sheaths are the critical anatomical factors which cause compression of the vein by sclerotic artery, leading to turbulent blood flow, endothelial damage and thrombus formation in retinal venous occlusion. Green *et al*, (2) in a histopathological study, on 29 enucleated eyes with CRVO (Central retinal vein occlusion), have documented that thrombus forms at or near the lamina cribrosa region. It is postulated that eyes with shorter axial length have smaller lamina cribrosa and a narrower scleral canal through which the central retinal vein and artery could pass, causing physical blockage in the vein which predisposes to thrombus formation (3).The relationship between Retinal Vein Occlusion and Axial Length has been studied by various workers in the world Ariturk N, *et al*.(4); Tsai *et al*.(5) and Chen HY (6). They have found that Axial Length can be a local risk factor in the causation of Retinal Vein Occlusion. In India Jyothi *et al.* (7) concluded that in CRVO, on an average affected eye is 1.52 mm shorter than the control eye.

At present, the efforts to improve visual acuity in retinal vein occlusion have been disappointing and a better understanding of various predisposing factors and pathophysiology assumes a lot of importance in the development of newer treatment modalities.Thus, the

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present study was conducted to access whether the Axial Length is a local risk factor in the development of Retinal Vein Occlusion and to determine the association between the Axial Length of the eye ball and Retinal Vein Occlusion.

Materials and Methods

The study was undertaken on 50 subjects, 25 of the Retinal Vein Occlusion and 25 age and sex matched controls attending the OPDs' of Ophthalmology, Government Medical College Jammu, during one year

Inclusion Criteria - Patients of either sex, both unilateral and bilateral cases and age and sex matched controls.

Exclusion Criteria- Patients with aphakia, pseudophakia, corneal leucoma retinal detachment and other intraocular lesions which interfere with axial length measurement.

All subjects underwent systemic and ocular examination. Systemic examination included evaluation of blood sugar, blood pressure, blood lipid levels and cardiovascular status. Ophthalmic examination included slit lamp examination, intraocular pressure measurement, ophthalmoscopy and gonioscopy.

Ocular axial lengths were measured by A-Scan ultrasonography (8), (9) and six consecutive readings were taken by the manual direct contact technique or contact applanation biometry. In this, cornea was anesthetized by using topical xylocaine (4%) drops. Patient was instructed to fix on a small red light with in the center of the probe tip. Probe was lightly touched to the cornea and A-Scan reading was taken.In patients with Retinal Vein Occlusion, the axial lengths of affected eyes were compared with the other healthy unaffected eyes and also with the control eyes

Statistical Analysis

The Data was expresed in Mean or percentage and Statistical analysis was performed by Chi-Square test and student't' test.

Results

Out of 25 patients, 60% were women and 40% were men. Their age ranged between 30 and 70 years with a mean of 54.09 years. 80% of patients belonged to rural area and 20% to the urban area. Right eye was involved in 56% and left eye in 40% of cases where as both eyes were involved in 4% of cases.In table I, statistically significant difference was found between the patients and controls regarding the values of hypertension, meaning that there is strong relationship between hypertension and development of Retinal Vein Occlusion. No significant difference was found between two groups for blood sugar, blood lipid levels and intraocular pressure in our study.As per the

Table 1. Showing Risk Factors

Diseases	Group-I (25 pts of RVO)	Group-II (control)	Crude odds ratio	p-value	Significance
Hypertension	15(60%)	3(12%)	11.00	.0004	Significant
Diabetes	3(12%)	2(8%)	1.57	.63	Not Significant
Hyperlipidemia	4(16%)	2(8%)	2.19	.38	Not Significant
Glaucoma	5(20%)	1(4%)	6.00	.163	Not Significant

Crude odds Ratio- Chi Square Test. P Value- Students 't' test (P<.005 Significant)

Table 2. Showing Comparison of Axial Lengths in Retinal Vein Occlusion with both Unaffected & Control Eye

Group	Affected Eyes mean Axial Length $^{+}$_ SD (mm)	Unaffected Eyes mean Axial Length $^{+}$_ SD (mm)	p-values
Group-I	21.73 +_ 0.741	22.56+_ 0.991	t (48) 2.45 p.018 P<.05
Group-II		23.49+_0.426	

t(5.29) p.001 (highly significant)

Fig 1. Showing Comparison of Axial Lengths

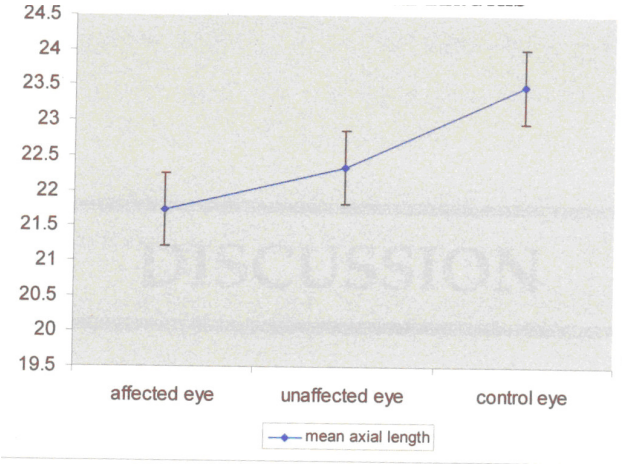

table 2 and *Fig 1*, the axial length of the affected eye was significantly shorter than the unaffected eye and the axial length of the unaffected eye was also significantly shorter than the control eye. On examination of fundus with ophthalmoscope, we found multiple superficial hemorrhages and tortuous and dilated retinal veins- The classic blood and thunder appearance in retinal vein occlusion (*Fig 2*)

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Fig 2. Classic Blood and Thunder Appearance in Retinal Vein Occlusion

Discussion

The risk factors for Retinal Vein Occlusion include hypertension, smoking, hyperlipidemias, hypercoagulable states (e.g., SLE, Leukemia), use of oral contraceptives and diuretics, retinal vascular inflammations or malformations, glaucoma and hyperopia (i.e., far-sightedness or an eye ball that is shorter than normal) (10). Hypermetropia is a risk factor for Retinal Vein Occlusion as also confirmed by Rath ZR, Gutman FD, and the eye disease case control study group (11,3,12). Refractive error can be affected by age related changes such as the effect of nuclear sclerosis on the power of the crystalline lens and therefore may not accurately represent hypermetropia. So we studied relationship between the Axial Length of Eye ball and Retinal Vein Occlusion instead of Hypermetropia and Retinal Vein Occlusion.

Hayreh SS had observed that most prevalent ages for Retinal Vein development were 65 years and older (13). In our study, 72% of cases were older than 50 years; Mean age was 54 years, Male:Female ratio 3:2. These correspond to the previous studies in the literature (13,14).The prevalence of hypertension, primary angle glaucoma and diabetes mellitus were found to be 57%, 32% and 14.6% respectively by Magargal (15).In our study, 60% patients had hypertension, 12 % patients had diabetes mellitus and 20% had glaucoma.

In eye with shorter axial length, scleral canal is smaller and the lamina cribrosa fenestrations are narrow. This creates crowding at the nerve fibers and central retinal vein and central retinal artery in the optic canal. Arteriosclerosis causes stenosis of both the artery and vein, decreasing the arterial perfusion pressure which leads to venous stasis; the changes in the vessel endothelium, cause platelet aggregation and that leads to thrombus formation. In our study, the mean difference in axial length of affected and unaffected eye was 0.83 mm and the mean difference in axial length of affected and control eye was 1.76 mm which is in accordance to the study done by Jyothi *et al*. (7). They found a difference of 1.52 mm between the axial length of affected and the control eye. We also found, statistically significant difference between mean axial length of affected eye and the contra-lateral unaffected eye. This difference could be due to the effect of macular edema in the involved eye. But the significant difference between the unaffected eye and control eye was not the consequence of the effect of macular edema. So there is a definite relationship between the short axial length of the eye ball and Retinal Vein Occlusion. These findings correspond exactly with the studies done by Aritruk N *et al* (4), Tsai Sc *et al* (5) Shi A *et al* (6) and Mehdizadeh M *et al* (16).

However Cekic O, Totan Y and Aydin E (17) reported that hyperopia as measured by axial length is not a risk factor for BRVO (Branch retinal vein occlusion). Also Ahmad Mirshahi (18) reported that there was no statistically significant difference between the mean axial

length of affected eye and the unaffected eye in CRVO.It is possible that the difference between the above studies may be due to difference in the selection of control group and methods of statistical analysis. Our study is limited by its small sample size. The controls should have been matched for other risk factors such as hypertension, diabetes, intraocular pressure and lipid levels. So that the effect of only one risk factor that is, axial length could have been studied. It is a crude analysis so we cannot say that the results are not confounded by other variables

We believe that multiple systemic and local factors gradually progress, affecting the ocular vasculature and eventually result in retinal venous obstruction. In our opinion the short axial length which results in a smaller scleral canal and scleral crowding impedes venous drainage of the retinal vasculature to some degree when the adjacent artery is sclerotic. This phenomenon causes decrease in ocular blood flow rate and venous stasis.

Conclusion

So we suggest that short axial length could be a local anatomical predisposing factor or a risk factor for the development of Retinal Vein Occlusion. Further studies with a larger number of patients are needed to establish this relationship.

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