International Journal of Research in Medical Sciences
Kouser F et al. Int J Res Med Sci. 2023 Apr;11(4):1106-1109
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012

DOI: https://dx.doi.org/10.18203/2320-6012.ijrms20230667

Original Research Article

The relationship between the axial length of the eye ball and the retinal vein occlusion

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Received: 09 February 2023
Revised: 02 March 2023
Accepted: 03 March 2023

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ABSTRACT

Background: Retinal vein occlusion is one of the most common form of retinal vascular diseases. There's a need for better understanding of various predisposing factors and pathophysiology of retinal vascular occlusions in order to improve the treatment modalities and have a better visual outcome including the relationship between axial length and retinal vascular occlusions.

Methods: The study was conducted on 60 patients attending the eye OPDs of upgraded department of ophthalmology of government medical college, Jammu during a period of six months from April 2022 to September 2022. 30 patients were clinically diagnosed cases of retinal vein occlusion whereas 30 patients were their age and sex matched controls. The axial length of both eyes of all the patients were measured using A scan Biometry. The data was then analysed by student t test and chi square test.

Results: It was found that 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.

Conclusions: It was concluded that the axial lengths in the patients having retinal vein occlusion were significantly shorter than the controls. The significant difference in the axial lengths can be a risk factor in the development of retinal vein occlusion.

Key Words: Axial length, Retinal vein occlusion, Biometry

INTRODUCTION

Retinal vein occlusion (RVO) is the most common form of retinal vascular disease following diabetic retinopathy.[1] Ocular vascular occlusive disorders collectively constitute the most common cause of visual disability in the middle-aged and elderly population, although no age is immune.[2] Retinal vascular disorders have been classified into the following; Central retinal vein occlusion (CRVO): This consists of: Non-ischemic CRVO (or venous stasis retinopathy), Ischemic CRVO (or hemorrhagic retinopathy), Hemi-central retinal vein occlusion (HCRVO): This also consists of: Non-ischemic HCRVO (or hemi-venous stasis retinopathy), Ischemic HCRVO (or hemi-hemorrhagic retinopathy), Branch retinal vein occlusion (BRVO): This consists of: Major BRVO and Macular BRVO.

Early recognition and treatment are 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. Klien et al postulated the following three occlusive mechanisms in CRVO: occlusion of the vein by external compression by sclerotic adjacent structures and secondary endothelial proliferation; occlusion by primary venous wall disease and hemodynamic disturbances produced by a variety of factors.[3] 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 did a histopathological study of 29 enucleated eyes from patients with CRVO and documented that thrombus formation was observed at or near the lamina cribrosa in eyes with CRVO and at the arteriovenous junction in BRVO.[4,5] Cekic et al suggested that eyes with shorter AL may be predisposed to greater crowding of the central retinal vein and artery at the lamina cribrosa, and are therefore more likely to develop CRVO.[6]

The relationship between Retinal Vein Occlusion and Axial Length has been studied by various workers in the world Ariturk et al, Tsai et al and Chen HY.[7-9] They have found that Axial Length can be a local risk factor in the causation of retinal vein occlusion. In India, Jyothi et al concluded that in CRVO, on an average affected eye is 1.52 mm shorter than the control eye.[10] There's a need for better understanding of various predisposing factors and pathophysiology of retinal vascular occlusions in order to improve the treatment modalities and have a better visual outcome. Thus, the 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.

METHODS

The study was conducted on 60 patients attending the eye OPDs of ophthalmology department of government medical college Jammu during a period of six months from April 2022 to September 2022. 30 of the subjects were clinically diagnosed to have retinal vein occlusion while 30 were age and sex matched controls.

Inclusion criteria

Patients of either sex, both unilateral and bilateral cases and age and sex matched controls were included.

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. 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 expressed in Mean or percentage and Statistical analysis was performed by Chi Square test and student t' test.

RESULTS

Out of 60 patients 60% were females while 40% were males. The age ranged between 30 and 70 years with a mean of 54.09 years. 80% of the patient belonged to rural area and 20% to the urban area.

Table 1: Risk factors.

Disease	Group 1 (30 patients of RVO) N (%)	Group 2 (Control), N (%)	Crude odds ratio	P value	Significance
Hypertension	18 (60)	4 (12)	11.00	0.004	Significant
Diabetes	4 (12)	3 (8)	1.57	0.63	Not significant
Hyperlipidemia	5 (16)	3 (8)	2.19	0.38	Not significant
Glaucoma	6 (20)	1 (4)	6.00	0.163	Not significant

Crude odds ratio: Chi square test, p value- student "t" test ($p<0.005$ significant).

Table 2: Comparison of axial length in retinal vein occlusion with both unaffected and control eye.

Group	Affected eye mean axial length±SD (mm)	Unaffected eye mean axial length±SD (mm)	P value
Group 1	21.73±0.741	22.56±0.991	t=(48) 2.45, p=0.018, p<0.05
Group 2	-	23.49±0.426	-

t=(5.29), p=0.001 (highly significant)

Right eye was involved in 56% and left eye in 40% of the cases whereas bilateral involvement was seen in 4% of the cases. In (Table 1), 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. The Data was expressed in Mean or percentage and Statistical analysis was performed by Chi-Square test and student t' test. As per the (Table 2), 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, t=(5.29), p=0.001 (highly significant).

DISCUSSION

The risk factors for Retinal Vein Occlusion include hypertension, smoking, hyperlipidemias, hyper-coagulable states (e.g., SLE, Leukemia), use of oral contraceptives and diuretics, retinal vascular inflammations or malformations, glaucoma and hyperopia. 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.[4,10]

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 had observed that most prevalent ages for Retinal Vein development were 65 years and older.[12] 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.[12,15]

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.[9] 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 et al, Tsai et al and Shi A et al.[7,8,11-15] However Cekic et al reported that hyperopia as measured by axial length is not a risk factor for BRVO (Branch retinal vein occlusion).[6] Also Ahmad et al reported that there was no statistically significant difference between the mean axial length of affected eye and the unaffected eye in CRVO.[16]

Limitations

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.

CONCLUSION

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.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Kouser F, Kai S, Gupta D, Raina B, Pushp S. The relationship between the axial length of the eye ball and the retinal vein occlusion. Int J Res Med Sci 2023;11:1106-9.