

**Assessment of Risk Factors and Diurnal Variability of Intraocular Pressure Patterns in the Eye Affected with Retinal Venous Occlusion**Faseela CC<sup>1</sup>, Praveen CP<sup>2\*</sup><sup>1</sup>Junior Resident, Department of Ophthalmology, Government Medical College, Kozhikode, Kerala, India<sup>2</sup>Additional Professor, Department of Ophthalmology, Government Medical College, Kozhikode, Kerala, India

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Conflict of interest: Nil

**Abstract:**

**Background and Objectives:** Retinal venous occlusion (RVO) is the second most common retinal vascular disease after diabetic retinopathy and is a major cause of visual loss worldwide. Age is the most important risk factor. Major local risk factor is glaucoma. Though glaucoma has been described as a risk factor for RVO, not many studies describe the occurrence of drop in intraocular pressure (IOP) following venous occlusive event and its mechanism. This study was an attempt to assess the risk factors associated with RVO and the diurnal pattern of IOP in the affected eye and compare it with the normal eye.

**Material and Methods:** The study had a comparative design and was done inside the setting of a hospital. Patients with unilateral retinal vein occlusion (RVO) were chosen from the Ophthalmology Outpatient Department (OPD) at the Ophthalmology department of the Government Medical College and Hospital in Kozhikode, Kerala, India using a convenient sampling method. This was accomplished subsequent to receiving authorization from the Scientific Review Committee and Institutional Ethics Committee, as well as obtaining written agreement from the patients. The ocular examination encompassed a thorough assessment of the anterior segment using a slit lamp, evaluation of visual function, measurement of intraocular pressure (IOP), and inspection of the fundus. SPSS was utilized for statistical analysis.

**Results:** Mean age of retinal vein occlusion is 57.3 years. RVO is seen more commonly in males (60%). Slight preponderance of left eye affection (56.67%) is seen. Hypertension is the most common risk factor (50%). Diurnal variation of intraocular pressure showed no significant difference between affected and unaffected eyes in each visit.

**Conclusion:** RVO is a common vascular disease of retina, of which, Superotemporal branch retinal vein occlusion is the most common type. The most common risk factor was found to be hypertension. Present study did not find any statistical significant difference in diurnal variation of intraocular pressures between affected and unaffected eyes.

**Keywords:** Applanation tonometry; Branch retinal vein occlusion; Central retinal vein occlusion; Diurnal variation; Intraocular Pressure; Schiottz tonometry.

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**Introduction**

Retinal vein occlusion (RVO) is the second most prevalent retinal vascular disease. Based on the zone of retinal vein drainage, it is categorized as branch retinal vein occlusion (BRVO), central retinal vein occlusion (CRVO), and hemi-retinal vein occlusion (HRVO). [1,2]

The correlation between retinal vein occlusion (RVO) and elevated intraocular pressure (IOP)/glaucoma has been extensively documented. [3-6]

Many systemic diseases may be associated with RVO including hypertension, dyslipidemia, diabetes mellitus, cardiovascular diseases,

hypercoagulable states like myeloproliferative disorders, hyperhomocysteinemia and inherited hypercoagulable disorders. Connective tissue disorder, peripheral vascular diseases, chronic renal failure and contraceptive pill use are also risk factors. Glaucoma is a prominent contributor to permanent vision loss on a global scale, and the number of people affected by glaucoma is projected to rise from 76 million in 2020 to 111.8 million in 2040. [7-9]

Identifying the role of intraocular pressure in the pathophysiology of RVO may facilitate the development of novel approaches for the

management and modification of RVO patient outcomes. This study was an attempt to assess the risk factors associated with RVO and the diurnal pattern of IOP in the affected eye and compare it with the normal eye.

**Aim and Objectives:** To assess the risk factors associated with RVO and the diurnal pattern of IOP in the affected eye and compare it with the normal eye.

#### Material and Methods

The study had a comparative design and was done inside the setting of a hospital. Patients with unilateral retinal vein occlusion (RVO) were chosen from the Ophthalmology Outpatient Department (OPD) at the Ophthalmology department of the Government Medical College and Hospital in Kozhikode, Kerala, India using a convenient sampling method. This was accomplished subsequent to receiving authorization from the Scientific Review Committee and Institutional Ethics Committee (GMCKKD/RP2016/EC/230), as well as obtaining written agreement from the patients.

**Inclusion Criteria:** Unilateral retinal vein occlusions including central retinal vein occlusion, hemicentral retinal vein occlusion and major branch retinal vein occlusions in 25-75 years age group in both sexes and with or without co morbidities.

#### Exclusion Criteria:

- Bilateral retinal vein occlusions
- RVO complicated by neovascular glaucoma
- Patients with intraocular inflammations
- Recent ocular trauma
- Recent ocular surgery within 1yr
- Glaucoma on treatment
- Patients taking IOP affecting drugs.

#### Sample size: 30

According to equation  $(Z\alpha+Z\beta)^2SD^2/d^2$ .

Za=1.96, Zb=0.84, SD=2.85, d=1.5 based on observation in a study conducted by J Frucht published in Br J Ophthal.

(n=sample size, SD=standard deviation, D=Precision)

#### Methodology:

Detailed history was taken, general and systemic examinations were done. Ocular examination included slit lamp examination of anterior segment, functional visual assessment, IOP recordings and fundus examination. IOP recorded in 1st visit after occlusive event in both eyes by Applanation tonometry (1 reading) and schiottz tonometry. IOP recorded by schiottz tonometry every 2 hourly from 6 am to 10 pm and diurnal variation of IOP assessed in both eyes. Recordings repeated 1 and 3 months following 1st visit.

In follow up visits also IOP recorded by applanation tonometry (1 reading) and schiottz tonometry every 2 hourly from 6 am to 10 pm and diurnal variation of IOP assessed in both eyes.

**Statistical Analysis:** The data was encoded and analyzed using the programme Statistical Package for Social Science version 18.0.

The association between several qualitative variables was evaluated using a chi-square test. The statistical review found that the probability value, p, was significant at a level of less than 0.05.

#### Results

A total of 30 patients were selected by convenient sampling. In present study, age ranged from 34-73 years. The demographic profile of study population was as shown in Table 1.

**Table 1: Demographic variables**

Variables		N	%
Age groups	<40 years	02	6.67
	40-60 years	16	53.33
	>60 years	12	40
Gender	Male	18	60
	Female	12	40
Laterality	Right eye	13	43.33
	Left eye	17	56.67
Type of occlusion	Ischemic CRVO	01	3.33
	Non ischemic CRVO	10	33.33
	Hemi CRVO	03	10
	ST BRVO	12	40
	IT BRVO	02	6.67
	Macular BRVO	02	6.67
Visual Acuity (Snellen's)	≤ 6/60	16	53.33
	6/60 – 6/18	10	46.67
	≥ 6/18	04	13.33

In the present study, 15 patients were hypertensive (HTN) (50%), 12 were diabetic (DM) (40%), 6 were having dyslipidemia (DLP) (20%) and 1 patient was having coronary artery disease (CAD) (3.33%), 5 patients were smokers (16.67%) and 8 were having no risk factors (26.67%) in this study. 13 (43.33%) were having multiple risk factors. [Table 2]

**Table 2: Risk factors associated with RVO**

Risk factors	Frequency (N)	Percentage (%)
0	8	26.67
1	4	13.33
2	2	6.67
3	1	3.33
5	2	6.67
1,2	5	16.67
1,3	1	3.33
1,4	1	3.33
1,5	1	3.33
1,2,3	2	6.67
1,2,5	1	3.33
2,3	1	3.33
2,3,5	1	3.33

0 – No risk factors, 1 – HTN, 2 – DM, 3 – DLP, 4 – CAD, 5 – Smoking. Mean diurnal variation of IOP in affected and normal eyes at baseline, at 1 month and at 3 months are within normal limits. There is no statistically significant difference of mean diurnal variation of IOP between affected and unaffected eyes in each visit. [Table 3]

**Table 3: Diurnal variation of IOP**

Variable	Affected eye Mean (SD)	Unaffected eye Mean (SD)	Difference Mean (SD)	P value
phasing-baseline	4.1 (0.9)	3.8 (1.2)	0.2 (1.0)	0.21 (NS)
phasing -1 month	4.0 (1.1)	3.8 (1.1)	0.2 (1.4)	0.47 (NS)
phasing -3 month	3.7 (0.8)	3.9 (1.1)	-0.2 (1.4)	0.38 (NS)

NS- Not Significant, S- Significant

## Discussion

In our study, 30 subjects with age ranging from 34 to 73 years were included by convenient sampling. We found that mean age of subjects was 57.3 years, with mean age of CRVO being 58.36 years, and that of hemi CRVO and BRVO being 60 and 56.06 years respectively. 53.33% RVO cases belonged to age group of 40-60 years in our study. But in most of studies related to RVO, it has been found to occur in 6th and 7th decades of life. [10-12]

Males and females were affected in a ratio of 1.5:1 in this study. Although there is no gender predilection in many of the studies, in a study by Hayreh SS, all categories of RVO, except major BRVO, were more common in men than in women. [3] Explanation for increased incidence of RVO in males is on hormonal basis. Higher haematocrit in males could act as a contributory factor in elevating blood viscosity and producing RVO. [12] In the present study, there is a slight preponderance in occurrence of occlusion in left eye (56.67%) compared to right eye (43.33 %). In the study by Hayreh, it was found that only ischemic CRVO and major BRVO showed evidence that RVO occurs more often in one (major BRVO in right eye in 57%) or the other (ischemic CRVO in left eye in 57%) eye. Among the other 4 types of RVO there

was no significant difference between the involvements of the two eyes. [3] In our study, among the different types of occlusions, ST BRVO was the most common type (seen in 40% cases) followed by non-ischemic CRVO (33.33%). Total BRVO cases constitute 53.3%, CRVO 36.67% and hemi CRVO 10%. According to Michell P et al BRVO constitute 69.5%, HCRVO-5.1%, CRVO-25%3 .Branch retinal vein occlusion study group conclude that BRVO is 2 to 6 times more common than CRVO. [13]

In this study, 53.33% of subjects had baseline visual acuity of  $\leq 6/60$  and 46.67% had VA of 6/60-6/18. Only 13.33% subjects were having VA better than 6/18. In a study, majority of patients with CRVO presented with grossly diminished vision below 6/60. [12] This number amounted to almost 84% of the total CRVO cases. Majority of BRVO cases who presented with vision less than 6/60, were found to have macular edema. In a study by Rogers S et al, [14] it was found that patients with ischemic CRVO are much more likely to have poor VA than non-ischemic type. In the present study, snellens VA in the only 1 case of ischemic CRVO was 1/60. 50% were hypertensives in our study, 40% were diabetic and 43.33% were having multiple risk factors with most common

combination of risk factors being hypertension along with diabetes. In all the described studies, hypertension was the most common risk factor. [15]

Mean diurnal variation of IOP in affected eyes is  $3.7 \pm 0.2$  mmHg and that in unaffected eye is  $3.8 \pm 0.1$  mmHg in this study. There is no statistically significant difference of diurnal variation of IOP between affected and unaffected eyes in each visit. Sihota et al. reported that the diurnal fluctuation in a normal eye is  $4.83 \pm 2.46$  mmHg. [16]

**Limitations of the study:** Since current sample size was small, studies with more number of patients are required to statistically analyze the IOP patterns in RVO and to accurately establish its clinical significance. The study population may not represent the general population as it is conducted in a tertiary center. Our study did not take ocular rigidity and central corneal thickness into consideration, which may affect the IOP reading.

### Conclusion

RVO is a common vascular disease of retina, of which, Superotemporal branch retinal vein occlusion is the most common type. The most common risk factor was found to be hypertension. Present study did not find any statistical significant difference in diurnal variation of intraocular pressures between affected and unaffected eyes.

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