

Findings of Optical Coherence Tomography in Patients of Retinal Vein Occlusion: An Observational Study

Amreen Anjum Deshmukh¹, Venukumar Lachmaya Rangu², Rupali Venukumar Rangu³, Hafiz Deshmukh⁴

¹Assistant Professor, Department of Ophthalmology, JIIU's Indian Institute of Medical Science & Research, Warudi, Badnapur, Jalna, MS, INDIA

²Associate Professor, Department of Ophthalmology, Government Medical College, Chh. Sambhaji Nagar, MS, India

³ Professor, Department of Ophthalmology, JIIU's Indian Institute of Medical Science & Research, Warudi, Badnapur, Jalna, MS, INDIA

⁴Assistant Professor, Department of Respiratory Medicine, MGM Medical College & Hospital, Chh. Sambhaji Nagar, MS, India

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Corresponding Author: Dr. Amreen Anjum Deshmukh

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Abstract:

Introduction: Retinal vein occlusion is a common cause of vision loss in older patients, and the second most common retinal vascular disease after diabetic retinopathy. Optical coherence tomography plays an important role in diagnosis of posterior segment diseases. This study establishes the importance of OCT in diagnosis and visual prognosis of retinal vein occlusion.

Materials and Methods: This is a prospective observational study conducted at a tertiary care hospital. 30 patients who presented to outpatient department with retinal vein occlusion were included in the study and evaluated on the basis of visual acuity, age, type of Retinal vein occlusion, OCT findings.

Results: Retinal vein occlusion was found to be more prevalent above age 40 years, in male patients, and those having co-morbidities like hypertension, diabetes, dyslipidemia. Significant correlation was found between foveal thickness and visual acuity.

Conclusion: This study concludes that BRVO is more common than CRVO. OCT plays an important role in diagnosis and predicting the visual prognosis.

Keywords: Retinal Vein Occlusion, OCT.

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Introduction

Retinal vein occlusion is a common cause of vision loss in older patients, and the second most common retinal vascular disease after diabetic retinopathy.

[1]

Retinal vein occlusion has a prevalence of 1 to 2% in patients older than 40 years of age and affects 16 million patients worldwide. [2-4] in a population-based cohort study, the 10-year incidence of retinal vein occlusion was 1.6% [5]. Bilateral retinal vein occlusion is uncommon (occurring in about 5% of cases), although in 10% of patients with retinal vein occlusion in one eye, occlusion develops in the other eye over time. [6]

Retinal vein occlusion are of two types, first one is branch retinal vein occlusion (BRVO), here the occlusion is typically at an arteriovenous intersection and second one is central retinal vein occlusion (CRVO), here the occlusion is at or

proximal to the lamina cribrosa of the optic nerve. Central retinal vein occlusion is further divided into the non-ischemic and ischemic, each of which has implications for prognosis and treatment. Branch retinal vein occlusion (BRVO) is four times as common as central retinal vein occlusion (CRVO). [4]

Optical coherence tomography is a novel non-invasive diagnostic imaging technique which produces high resolution cross-sectional tomographs of ocular tissues. It can be used in the diagnosis and assessment of various posterior segment diseases. Previous studies suggested that serous retinal detachment (SRD), hard exudates at the fovea and loss of the photoreceptor layer on optical coherence tomography (OCT) images are related to a poor visual prognosis.

These changes damage the neurosensory retina and the retinal pigment epithelium (RPE). OCT allows observation of the morphological changes in the retina caused by RVO. [7-10] so we planned this study to observe optical coherence tomography findings in patients with retinal vein occlusion and their visual prognosis.

Material and Methods:

This is a prospective observational study conducted in department of Ophthalmology in a tertiary health care center to observe optical coherence tomography findings in patients of Retinal Vein Occlusion and their visual prognosis. The objectives of the study were to assess impact of retinal vein occlusion on visual acuity, to determine the incidence of different types of retinal vein occlusion and to evaluate the influence of foveal thickness on visual acuity.

Sample size was calculated by using the following formula,

Sample Size: 30 eyes

$$\text{Sample size (N)} = Z \times Z \times P \times (100 - P) / d \times d$$

Where,

Z= statistic for a level of confidence (here Z=1.96 at 95% confidence interval)

P= expected prevalence (Here prevalence of RVO is taken as 2%)

d=precision taken as 5

$$\text{Therefore, sample size } N = [(1.96) (1.96) \times 2 \times 98] / (5 \times 5) = 30$$

Sample size = 30

Patients clinically diagnosed of retinal vein occlusion were included in the study.

Patients having media opacities, history of macular laser photocoagulation or intravitreal injection of triamcinolone or anti-VEGF agents, cases of branched retinal artery occlusion and central retinal artery occlusion, vitreous haemorrhage and sub-

hyaloid haemorrhage were excluded from the study. Patients with diabetic retinopathy with clinically significant macular edema and post-operative cystoid macular edema were not included in the study.

Methodology

This was a prospective and observational study done in 30 cases of retinal vein occlusion at tertiary health care center. All the patients presenting to OPD of Ophthalmology /Casualty with retinal vein occlusion irrespective of age or sex screened to include them in study.

This study was carried out for duration of 2 years. Patients fulfilling the inclusion criteria underwent detailed clinical history, general and systemic examination. Routine blood investigations were also done at the time of presentation. Ocular examination including the visual acuity testing by using Snellen's charts, E charts, measurement of intraocular pressure (IOP) with non-contact tonometer. Slit lamp examination, fundoscopic examination including both direct and indirect Ophthalmoscopy were also performed. Other important investigations performed were Fundus Fluorescein Angiography, wherever necessary and OCT Evaluation.

Data Entry and Statistical Analysis

All the collected data was entered in Microsoft Excel sheet. It was then transferred to SPSS ver. 17 software for statistical analysis. All the Quantitative data was presented as mean and standard deviation. Qualitative data was presented as frequency and percentage. Karl Pearson correlation coefficient was applied. P-value of < 0.05 was considered as significant.

Results

The present study was conducted in 30 patients with Retinal Vein Occlusion who presented to the department of Ophthalmology, of a tertiary health care center of Aurangabad to observe the findings of optical coherence tomography and visual prognosis of RVO.

Table 1: Distribution of study subjects based on age group

Particular	No. of patients [n=30]		Percentage
Age group (yrs)	≤ 40	2	6.7%
	41-60	11	36.7%
	61-80	13	43.3%
	> 80	4	13.3%
	Total	30	100.0%
Mean±SD	61.0 ± 11.2 years		
Gender	Male	17	56.7%
	Female	13	43.3%

In the present study, mean age of patients was 61 years. More than 80% of patients had age between 41 to 80 years Males were more commonly affected than female and M: F ratio was 1.3:1.

Table 2: Distribution of subjects according to type of Retinal Vein Occlusion, quadrant involved in BRVO and type of CRVO

		No. of patients	Percentage
Type of RVO	BRVO	20	66.7%
	CRVO	10	33.3%
Type of BRVO [n=20]	Superotemporal	14	70%
	Inferotemporal	6	30%
Type of CRVO [n=10]	Non-ischemic	9	90%
	Ischemic	1	10%

In the present study, it was observed that BRVO i.e 20 (66.7%) was more common than CRVO i.e 10(33.3%). In 70% of the patients with BRVO supero-temporal quadrant was involved and inferotemporal quadrant affected in 30% of the patients of BRVO and majority of the patients i.e 9(90.0%) had non-ischemic type of CRVO.

Table 3: Distribution of study subjects based on Co-morbidities

Co-morbidities	No. of patients [n=30]	Percentage
Hypertension	19	63.3%
Diabetes mellitus	9	30.0%
Ischemic heart disease	5	16.7%
Dyslipidemia	5	16.7%
transient ischemic stroke (TIA) / CVA	2	6.7%

In present study, hypertension was the most common co-morbidity observed in study subjects (63.3%) followed by diabetes (30%). IHD, Dyslipidemia (16.7%) each and TIA (6.7%).

Table 4: Distribution of study subjects based on OCT Findings

OCT Findings	No. of patients [n=30]	Percentage
Hyper reflectivity Inner layer	26	86.7%
Intra-retinal fluid	28	93.3%
Serous Retinal Detachment	13	43.3%
Loss of Foveal IS/OS Junction	5	16.7%
Loss of Inner Retinal Layer	8	26.7%

Most common Optical coherence tomography findings were Intra retinal fluid (93.3%) followed by Hyper reflectivity of Inner layer (86.7%), serous retinal detachment (43.3%), loss of inner retinal layer (26.7%) and loss of foveal IS/OS junction (16.7%).

Table 5: Distribution of study subjects based on Foveal Thickness

Foveal Thickness (μ)	No. of patients [n=30]	Percentage
≤ 250	6	20.0%
251-500	17	56.7%
> 500	7	23.3%
Total	30	100.0%

Mean foveal thickness of the patients was 502.7 μ m. 56.7% patients had foveal thickness in the range of 251-500 μ m while 23.3% of the patients had foveal thickness above 500 μ m.

Table 6: Distribution of study subjects based on Visual Acuity

		No. of patients [n=30]	Percentage
Visual Acuity	6/6	5	16.7%
	6/9	1	3.3%
	6/12	3	10.0%
	6/18	10	33.3%
	6/24	4	13.3%
	6/36	1	3.3%
	$\leq 6/60$	5	16.7%
	CF	1	3.3%
degree of effect on Visual Acuity	Minimal	19	63.3%
	Mild	5	16.7%
	Moderate	5	16.7%
	Marked	1	3.3%

Visual acuity of 6/6 was observed in 16.7% subjects while 20% of subjects had visual acuity of 6/60 or worse. Most of study subjects (63.3%) had minimal effect on their visual acuity while 20% had moderate to marked effect on visual acuity.

Table 7: Co-relation of Foveal Thickness and Visual Acuity

Foveal thickness Vs BCVA	
r- value	-0.41
p-value	< 0.01

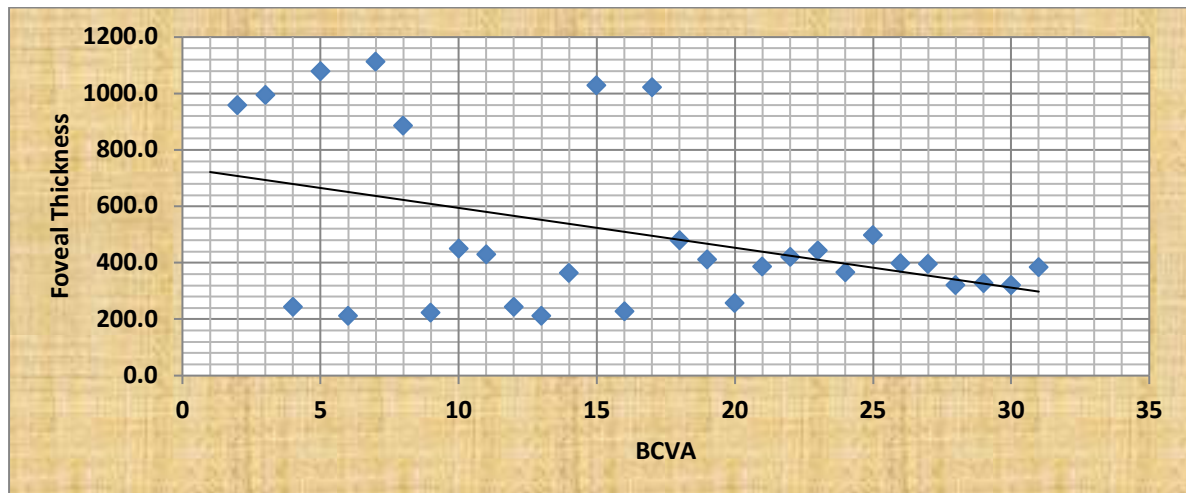


Figure 1: Scatter diagram of BCVA and Foveal Thickness

Significant negative correlation was observed between foveal thickness and visual acuity ($r = -0.41$; $p < 0.05$).

Discussio

Retinal vein occlusion is more prevalent in patients older than 40 years of age and having comorbidities like hypertension and diabetes. In the present study, more than 80% of patients had age between 41 to 80 years and males are more commonly affected than females. In the study of Thapa R et al. 218 patients with RVO were included, the mean age of the patients was 61.1 ± 12.3 years and they also observed that more men (58.3%) affected than women. [11]

In the present study, it was observed that BRVO (2/3rd) was more common than CRVO (1/3rd). In 70% of the patients with BRVO supero-temporal quadrant was involved and inferotemporal quadrant affected in 30% of the patients of BRVO and majority of the patients had non-ischemic type of CRVO. FFA was performed in patient of ischemic CRVO, but due to extensive haemorrhages, status of macular perfusion could not be assessed. In a study by Thapa R et al. 70% of subjects had BRVO, whereas CRVO was present in 26.6%. [11] Similarly in a study conducted by Lee JY et al. 557 patients with retinal vein occlusion (RVO) were included, 36.4% patients had CRVO and 63.6% patients had BRVO. 12 Other studies also found that BRVO was more prevalent than CRVO. [13,14] In the study conducted by Hyreh S. S. et al

[15], non-ischemic CRVO (81%) was more common than ischemic CRVO (19%). In our study, hypertension was the most common co-morbidity observed in study subjects (63.3%) followed by diabetes (30%). IHD, Dyslipidemia (16.7%) each and TIA (6.7%). Similar risk factors were observed in previous studies. In a study by Thapa R et al. it was found that hypertension was significantly higher in all RVO cases relative to the control groups. [11]

Similarly Hypertension was commonly found as comorbidity in patients with retinal vein occlusion in various studies done by Simons BD et al [16], Hayreh SS et al. [17], O'Mahoney PRA et al [18], and Shahsuvaryan ML et al. [19] Most common Optical coherence tomography findings were Intra retinal fluid (93.3%) followed by Hyper reflectivity of Inner layer (86.7%), serous retinal detachment (43.3%), loss of inner retinal layer (26.7%) and loss of foveal IS/OS junction (16.7%). Visual acuity of 6/6 was observed in 16.7% subjects while 20% of subjects had visual acuity of 6/60 or worse. Most of study subjects (63.3%) had minimal effect on their visual acuity while 20% had moderate to marked effect on visual acuity. Lima VC et al. performed a study to find out the correlation between spectral domain optical coherence tomography findings and visual outcomes in central retinal vein occlusion. They divided the patients into two groups according to final visual acuity, group 1 ($\leq 20/200$) and group 2 ($> 20/200$). They observed that Group 1 (10 eyes) had significantly higher rates of residual

intra-retinal fluid, loss of foveal inner segment/outer segment (IS/OS) junction line and loss of inner retinal layers in late stage SD-OCT images ($P = 0.027$) when compared with group 2 (12 eyes). [20] Mean foveal thickness of the patients was $502.7\mu\text{m}$. 56.7% patients had foveal thickness in the range of $251\text{--}500\mu\text{m}$ while 23.3% of the patients had foveal thickness above $500\mu\text{m}$. Significant negative correlation was observed between foveal thickness and visual acuity ($r = -0.41$; $p < 0.05$). Similar findings were observed in the study done by Scott et al. [21]

Conclusion:

The present study concluded that BRVO is more common than CRVO, with a male preponderance, with Hypertension being the most common systemic association. Superotemporal quadrant of the retina is mostly affected. OCT plays a key role in predicting prognosis of this condition and can be used to monitor disease progression and management.

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