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Original Research Article

Comprehensive Study of Eye Disorders Linked to Retinal Vein Occlusion

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Abstract:

Background: Retinal vein occlusion (RVO) is a significant cause of visual impairment and blindness, encompassing two main types: central retinal vein occlusion (CRVO) and branch retinal vein occlusion (BRVO). This study provides a comprehensive analysis of eye conditions associated with RVO, aiming to elucidate the underlying mechanisms, risk factors, and therapeutic approaches. RVO occurs when a blood clot blocks the vein, leading to a build-up of blood and fluid, causing swelling and hemorrhage in the retina. CRVO involves the main vein of the retina, while BRVO affects smaller branches. The etiology of RVO is multifactorial, with hypertension, diabetes mellitus, hyperlipidemia, and glaucoma identified as significant risk factors. Additionally, systemic inflammatory conditions and blood disorders can predispose individuals to RVO.

Aim: The aim of this study is to provide a comprehensive analysis of eye conditions associated with retinal vein occlusion (RVO), focusing on the underlying mechanisms, risk factors, diagnostic advancements, and therapeutic approaches.

Material and Method: This cross-sectional observational study was carried out in the ophthalmology department. Prior to participation, all subjects provided their written, informed consent and were briefed on the study's objectives. Information such as the patient's name, age, and gender was recorded. The questionnaire included queries about the history of the illness and any previous ocular trauma or surgeries. A history of systemic illnesses was also collected. All participants underwent a comprehensive ophthalmologic examination. Visual acuity was assessed using an illuminated Snellen's Chart. Detailed slit lamp examinations were conducted, and dilated fundoscopy was performed using a direct ophthalmoscope, an indirect ophthalmoscope, and slit lamp biomicroscopy. When necessary, optical coherence tomography was employed to confirm the presence of macular edema. Visual acuity ranging from 6/18 to 6/60 was classified as visual impairment, while acuity better than 6/18 was classified as blindness.

Results: The patients' ages ranged from 41 to 77, with a median age of 66 and a mean age of 58. The study included 57 female and 43 male patients. Among them, 54 had BRVO, 38 had CRVO, and 8 had HRVO. Statistical analysis did not reveal a significant relationship between BCVA and RVO. Macular edema was observed in 11 patients with BRVO. In the CRVO group, 16 patients had vitreous hemorrhage (VH), 9 had macular edema (ME), and 3 exhibited iris neovascularization (INV). Additionally, 4 patients had disc neovascularization (DNV). VH was also present in one HRVO patient. Overall, patients with CRVO experienced a higher incidence of ocular complications compared to those with BRVO and HRVO.

Conclusion: The identification of complications associated with RVOs is imperative due to their potential threat to vision. Early diagnosis of the condition is vital to mitigate the risk of irreversible blindness. By promptly diagnosing RVOs, various treatment modalities can be implemented to effectively address these complications, thus significantly reducing the burden of blindness. In our medical facility, central retinal vein occlusion is more prevalent than peripheral retinal vein occlusion, with women being disproportionately affected compared to men. The early detection of RVO-related issues can play a crucial role in reducing the societal impact and cost associated with blindness.

Keywords: retinal vein occlusion, complications, diagnosis, treatment approaches, central retinal vein occlusion, peripheral retinal vein occlusion, gender disparity, irreversible blindness, early detection and social cost.

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Introduction

Retinal disorders, with retinal vein occlusions (RVO) ranking as the second most common after diabetic retinopathy, present a growing threat to global vision health, leading to increasing rates of vision loss and blindness. [1] The surge in systemic conditions such as hypertension, diabetes mellitus, cardiovascular diseases, and hyperlipidemia predisposes individuals to retinal complications, often stemming from shifts in lifestyle behaviors. [2,3]

Inadequate diagnosis and treatment can result in irreversible visual impairment, highlighting the critical need for proper management of these conditions. [4] RVO, the second most prevalent retinal vascular disorder after diabetic retinopathy, encompasses two primary types: branch retinal vein occlusion (BRVO) and central retinal vein occlusion (CRVO).

BRVO cases outnumber CRVO instances, with BRVO involving the blockage of a branch of the retinal vein system and CRVO affecting the central retinal vein. [5] Hayreh's classification further divides RVO into subtypes, including major BRVO, macular BRVO, ischemic CRVO, nonischemic CRVO, and hemi-CRVO, which can be ischemic or nonischemic depending on the extent of retinal involvement. [6,7] Central retinal vein occlusion and branch retinal vein occlusion collectively represent the second most prevalent retinal vascular disease globally, trailing only behind diabetic retinopathy. [8,9]

Evidence from eye health reports across various regions of Nigeria underscores the significant contribution of retinal vein occlusions to ocular morbidity in affected populations. [10] Abiose [11] and Ayanru [12] in earlier studies separately reported the rarity of retinal vascular diseases, including retinal vein occlusion in Nigeria. However, a hospital-based study in Anambra State revealed that 12.5% of retinal disorders are caused by retinal vein blockage. [13]

Retinal vein occlusions (RVOs) represent the second most common retinal vascular disorder following diabetic retinopathy and can lead to significant visual impairment if left untreated. RVOs manifest as obstructions in retinal venous circulation and can occur as central retinal vein occlusion (CRVO), branch retinal vein occlusion (BRVO), or hemi-retinal vein occlusion (HRVO). [14]

Among the ocular complications associated with RVO, macular edema and vitreous hemorrhage (VH) are notable. Macular edema develops in 5-15% of RVO cases within a year.

The precise pathophysiology of CRVO remains elusive, although it is believed to involve thrombus formation within the posterior lamina cribrosa or central retinal vein, leading to obstruction. [15] Endothelial changes in response to artery and vein stenosis in the central retina can also contribute to alterations in venous flow. Alternatively, theories suggest that initial lesions such as compression or inflammation of the optic nerve, structural abnormalities of the orbit, or changes in the lamina cribrosa may precede the development of central retinal vein thrombosis, which represents an advanced stage of the condition. [16]

The Guinness Eye Center addressed both ocular and systemic conditions known to predispose individuals to retinal vein occlusion (RVO), while also administering low doses of aspirin to potentially reduce blood platelet aggregation. Due to limited laboratory capabilities at the time, only packed cell volume and platelet counts were assessed, as the center lacked the capacity to quantify serum lipids and cholesterol levels.

Laser therapy and fluorescein angiography were unavailable resources. [17] Branch retinal vein occlusion (BRVO) and central retinal vein occlusion (CRVO) are prevalent among Caucasian adults aged 40 and above, with BRVO ranging between 0.6% and 1.1% and CRVO between 0.1% and 0.4%.

The treatment of RVO remains challenging due to its complex nature. [18,19] Various therapeutic modalities, including laser photocoagulation, intravitreal steroids, anti-VEGF agents, surgical procedures such as pars plana vitrectomy, and systemic treatments like hemodilution, anticoagulation therapy, and fibrinolysis, have been explored. However, their efficacy as definitive causal treatments has yet to be validated through large randomized studies. [20]

Material and Methods

This cross-sectional observational study was carried out in the ophthalmology department. Prior to participation, all subjects provided their written, informed consent and were briefed on the study's objectives. Information such as the patient's name, age, and gender was recorded.

The questionnaire included queries about the history of the illness and any previous ocular trauma or surgeries. A history of systemic illnesses was also collected. All participants underwent a comprehensive ophthalmologic examination. Visual acuity was assessed using an illuminated Snellen's Chart.

Detailed slit lamp examinations were conducted, and dilated fundoscopy was performed using a direct ophthalmoscope, an indirect ophthalmo scope, and slit lamp biomicroscopy.

When necessary, optical coherence tomography was employed to confirm the presence of macular

edema. Visual acuity ranging from 6/18 to 6/60 was classified as visual impairment, while acuity better than 6/18 was classified as blindness.

Inclusion criteria

- Patients aged 18 years and above.
- Diagnosed with retinal vein occlusion (RVO), including both central retinal vein occlusion (CRVO) and branch retinal vein occlusion (BRVO).
- Willingness to provide informed consent for participation in the study.
- Availability for follow-up examinations and treatment sessions as required by the study protocol.
- Ability to undergo necessary ophthalmic evaluations and diagnostic tests.

Exclusion criteria

- Patients below the age of 18.
- History of previous retinal surgeries or laser interventions for retinal vein occlusion.
- Presence of other significant ocular comorbidities such as advanced glaucoma or retinal detachment that may confound the study outcomes.
- Inability to provide informed consent due to cognitive impairment or language barriers.
- Pregnant or lactating individuals, as the study interventions may pose potential risks to maternal and fetal health.
- Known allergy or contraindication to any of the study medications or interventions.
- Participation in other concurrent clinical trials involving investigational treatments for retinal vein occlusion.

Statistical Analysis:

For quantitative and qualitative analysis, mean and standard deviation, frequency, and percentage tables were used. Fisher, Student, and Chi-Square tests were used to see whether there was any association between the research groups.

A p-value of 0.05 or less was regarded as significant. For statistical analysis, SPSS ver. 20 and MS Excel were both used. MS Excel 2010 was used for the graphic representation.

Result:

BRVO was found in 54(54%) patients, CRVO in 38 (38%) patients, and HRVO in 8 (8%) patients.

Table 1: Association of BCVA and RVO

Type of Occlusion	>6/18		BCVA 6/18 - 6/60		< 6/60		Total	
	N	%	N	%	N	%	N	%
BRVO	5	5%	12	12%	37	37%	54	54%
CRVO	2	2%	7	7%	29	29%	38	38%
HRVO	1	1%	1	1%	6	6%	8	8%
Total	8	8%	20	20%	72	72%	100	100%

Among patients with branch retinal vein occlusion (BRVO), 5% exhibited best corrected visual acuity (BCVA) exceeding 6/18, while 12% and 37% had BCVA ranging from 6/18 to 6/60 and less than 6/60, respectively.

In the central retinal vein occlusion (CRVO) group, 2% demonstrated BCVA greater than 6/18, with 7% and 29% falling within the BCVA range of 6/18 to 6/60 and less than 6/60, respectively. In cases of hemi-retinal vein occlusion (HRVO), 1% of patients had BCVA surpassing 6/18, while 6% had BCVA between 6/18 and 6/60, and 6% had BCVA less than 6/60. Statistical analysis revealed no significant association between BCVA and retinal vein occlusion (RVO).

Table 2: Association of ocular complications and RVO

	Ocular Complications							
Type of Occlusion	**VH**		**ME**		**INV**		**DNV**	
	N	%	N	%	N	%	N	%
BRVO	0	-	11	11%	0	-	0	-
CRVO	16	16%	9	9%	3	3%	4	4%
HRVO	1	1%	0	-	0	-	0	-

Among patients with branch retinal vein occlusion (BRVO), 11% experienced macular edema (ME).

In the central retinal vein occlusion (CRVO) group, 16% presented with vitreous hemorrhage (VH), while 9% and 3% exhibited ME and iris neovascularization (INV), respectively. Additionally, 4% of patients demonstrated disc neovascularization (DNV). VH was observed in 1% of patients with hemi-retinal vein occlusion (HRVO). Notably, the incidence of ocular complications was notably higher among patients with CRVO in comparison to those with BRVO and HRVO.

Table 3: Age and sex distribution

Age (Years)	M	F	Total	%
41-50	5	13	18	14.6
51-60	18	9	27	22.6
61-70	16	20	36	41.9
≥71	4	15	19	20.9
Total	43	57	100	100.0

The age range of the patients was 41–77 years; with a median of 66 years and a mean of 58 years. There were 43 (39.5%) male and 57 (60.5%) female patients.

Discussion

In this study, our findings corroborate previous research highlighting the significant burden of retinal vein occlusion (RVO) as a leading cause of vision impairment. The inclusion of both central retinal vein occlusion (CRVO) and branch retinal vein occlusion (BRVO) cases provides a comprehensive understanding of the clinical spectrum and management challenges associated with RVO. [17]

Our study underscores the importance of early diagnosis and timely intervention in mitigating vision-threatening complications such as macular edema and vitreous hemorrhage. However, the limitations of available treatment modalities underscore the need for further research to explore novel therapeutic strategies and optimize patient outcomes. Additionally, the study's reliance on retrospective data and the absence of long-term follow-up represent inherent limitations that warrant consideration. [9]

Sankar B et al 2016 [21] reported that 9 of the 13 cases of CRVO had macular edema, 4 cases showed CNP. 4 out of 35 cases of BRVO, showed areas of capillary non-perfusion (CNP) alone, without neovascularization, out of which 1 had CNP more than 5 DD. Four instances exhibited NVD/NVE evidence, twenty cases had macular edema, and two cases had both neovascularization and macular edema. Fiebai B et al 2014 [22] study assessing the incidence and risk factors of RVO, reported that macular edema, vitreous hemorrhage, and neovascularization (both iris and disc) were the ocular complications associated with RVO.

Out of the 27 cases, 19 (70.4%) had these. VH (52.6%) was the most frequent consequence and it affected patients with CRVO the most (94.7%). Prajapati VA et al.2014 [23] observed that vision loss was more in CRVO than in BRVO. The most frequent problem, reported by 43 (86%) individuals, was macular edema, followed by neovascular glaucoma in 10 (20%) patients. Mitchell et al. 1996 [24] reported bilateral involvement in 5.1% of subjects. The larger percentage in our population may be brought on by the presence of more old people and unchecked systemic disorders. For additional analysis, the lipid panel and glycosylated hemoglobin would be useful. The two studies' different sample sizes could be the cause of the different laterality. According to a study conducted in a significant teaching hospital in the United States, patients with retinal vein blockage also had increased rates of hypertension and diabetes mellitus. [25] Treatment options could alter how these ocular and systemic risk factors progress. In order to possibly avoid the development of the condition, aggressive treatment of the ocular and systemic risk factors is advised.

The recently published meta-analysis of Jaulim et al.2013 [26] showed pooled data on main and subsidiary risk factors connected to BRVO. Rogers et al.2010 [27] showed a 1.57 per 1,000 prevalence of BRVOs in 40-to-49-year-olds (4.58 per 1,000), in 50-to-59-year-olds (11.11 per 1,000), and in 60-to-69-year-olds, 12.76 per 1,000 in 70-to-79-year-olds, and 10.32 per 1,000 in those older than 80 years. The prevalence in subjects older than 80 is 7 times higher than in people from 40 to 49 years. Glueck et al.2008 [28] in a case-control study identified elevated homocysteine and factor V Leiden mutation as risk factors but found no association of anticardiolipin antibodies or lupus anticoagulant with CRVO. Di Capua et al.2010 [29] in a recent large case-control study found no association between CRVO and thrombophilic risk factors, including homocysteine levels and anticardiolipin antibodies.

The study's notable strength lies in its robust representation of the geriatric age group within the sample, offering valuable insights into retinal vein occlusion (RVO) within this demographic. However, a key limitation is the inability to extrapolate findings to younger populations, thereby hindering a comprehensive understanding of RVO's prevalence and associated risk factors among all age groups.

Furthermore, the absence of lipid panel tests and glycosylated hemoglobin assessments in this population-based study limited the exploration of additional risk factors for RVO. Additionally, challenges such as inadequate facilities for appropriate treatment may have contributed to patient default issues, despite the well-established link between retinal vein occlusion and vision impairment. Nevertheless, the widespread

recognition of retinal vein occlusion as a leading cause of vision impairment underscores the importance of early detection and treatment. Ageing and hypertension emerged as prominent risk factors in the elderly population, highlighting the significance of regular eye examinations and proactive management strategies to prevent blindness in this vulnerable demographic.

Conclusion:

Recognizing the potential vision-threatening complications associated with retinal vein occlusions (RVOs), prompt diagnosis becomes imperative. Early detection facilitates the timely initiation of various treatment modalities, significantly reducing the burden of blindness. Within our hospital, central retinal vein occlusion prevails over peripheral retinal vein occlusion, with a higher incidence observed among women compared to men.

Upon presentation, RVO exerts a detrimental impact on visual acuity, often leading to low vision or blindness, primarily affecting one eye. Thus, informing patients about the disease's characteristics, including identifiable risk factors and its typical progression, becomes essential. Establishing comprehensive facilities for both the study and efficient treatment of RVO emerges as a critical priority to ensure optimal patient outcomes.

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