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RESTORING VISION IN CENTRAL MACULAR EDEMA (CME) CAUSED BY CENTRAL RETINAL VEIN OCCLUSION (CRVO): SINGLE INTRAVITREAL BEVACIZUMAB INJECTION

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Abstract

***Introduction*:** *Central retinal vein occlusion (CRVO) is a frequent cause of visual impairment secondary to retinal vascular disease, with a prevalence of approximately 0.08% in individuals over 30 years of age. Cystoid macular edema (CME) represents the leading cause of vision loss in such cases. This report describes a favorable anatomical and functional outcome following a single intravitreal bevacizumab injection in CME secondary to CRVO.*

***Case Report**: A 41-year-old male presented with sudden onset of blurry vision in the left eye (LE) for 10 hours, predominantly affecting the superior and temporal fields. He denied ocular pain, photopsia, scotomas, diplopia, or redness. His had history of untreated hypertension. Blood pressure was 180/120 mmHg, visual acuity (VA) was 1/60 in the LE, and a positive relative afferent pupillary defect (RAPD) was present. Fundus examination revealed an edematous optic nerve head, tortuous retinal veins, and widespread hemorrhages. Optical coherence tomography (OCT) of the macula demonstrated massive intraretinal fluid (IRF) with a central macular thickness (CMT) of 779 µm. Laboratory investigations, including coagulation profile, were unremarkable. Antihypertensive therapy (amlodipine 10 mg qd, candesartan 16 mg qd) was initiated. A single intravitreal bevacizumab injection (1.25 mg) was administered. At 1-month follow-up, best-corrected visual acuity (BCVA) improved to 6/18, OCT confirmed complete resolution of IRF, and CMT decreased to 240 µm. These findings remained stable at 6 months, without recurrence or complications.*

***Result** A Treat-and-Extend (T&E) regimen – ≥3 consecutive monthly injections followed by interval extension—was initially planned. However, given the marked clinical and anatomical improvement after the first injection, the treatment strategy was modified to a pro re nata (PRN) approach. In real-world practice, the number of anti-vascular endothelial growth factor (VEGF) injections is often lower than in randomized controlled trials (RCTs) due to financial constraints, travel limitations, and decreased patient motivation after early improvement. PRN regimens provide a cost-effective, individualized alternative while preserving therapeutic efficacy.*

***Conclusion**: Single intravitreal bevacizumab may be a viable treatment for CME secondary to CRVO in selected cases. The choice between T&E and PRN regimens should be individualized based on clinical response and patient-specific factors, with simultaneous management of systemic vascular comorbidities.*

Keywords: central retinal vein occlusion, CRVO, intravitreal, bevacizumab **Cite This Article**: ISKANDAR, Ferdy; PERTIWI, Adinda Mulya; HUTAPEA, Mario Marbungaran. RESTORING VISION IN CENTRAL MACULAR EDEMA (CME) CAUSED BY CENTRAL RETINAL VEIN OCCLUSION (CRVO): SINGLE INTRAVITREAL BEVACIZUMAB INJECTION. **International Journal of Retina**, [S.l.], v. 8, n. 2, p. 175, oct. 2025. ISSN 2614-8536. Available at: <https://www.ijretina.com/index.php/ijretina/article/view/325>. Date accessed: 01 oct. 2025. doi: https://doi.org/10.35479/ijretina.2025.vol008.iss002.325..

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INTRODUCTION

Central retinal vein occlusion (CRVO) is a common sight-threatening retinal vascular disease, affecting approximately 0.08% of individuals over 30 years and 0.5% of those over 40 years.[1] The pathogenesis involves vascular endothelial damage and compression of the retinal vein, leading to thrombus formation. This will result in an increased retinal capillary pressure, causing fluid transudation and subsequent macular edema.[2]

Retinal vein occlusion (RVO) affects approximately 16.4 million adults worldwide, with 13.9 million cases of Branch retinal vein occlusion (BRVO) and 2.5 million cases of CRVO.[1,3–5] Among CRVO cases, cystoid macular edema (CME) is the most frequent complication causing vision loss, underscoring the need for effective treatment strategies.[1]

Intravitreal anti-vascular endothelial growth factor (anti-VEGF) agents, including ranibizumab, aflibercept, and off-label bevacizumab, have been shown to effectively improve both anatomical and functional outcomes in patients with macular edema secondary to CRVO. The pro re nata (PRN) regimen involves an initial loading phase of 4-weekly injections, followed by regular assessments to determine the need for further treatment. An alternative the treat-and-extend (T&E) protocol administers injections at every visit, gradually extending intervals if visual acuity and optical coherence tomography (OCT) remain stable, or shortening them if deterioration occurs.[1]

While multiple injections are often recommended, recent studies have suggested that in certain scenarios, a single intravitreal injection may provide significant clinical benefits in CME secondary to CRVO, potentially reducing the treatment burden and healthcare costs.[6,7] However, evidence regarding the long-term effectiveness and predictors of success of this approach remains limited.

In this case report, we present a patient with CRVO-associated CME who exhibited remarkable improvement following a single intravitreal bevacizumab injection.

CASE REPORT

A 41-year-old male presented to the emergency department at Cipto Mangunkusumo General Hospital, a tertiary care centre in Indonesia, with a complaint of sudden blurry vision in his left eye (LE) for the past 10 hours. He reported that the vision was especially affected in the superior and temporal regions of the eye. The patient denied any history of red eyes, light flashes, curtain-like shadows, double vision, or pain with eye movement. His medical history included hypertension, for which he had not been taking any medication.

On examination, the visual acuity (VA) of the (LE) was 1/60, with the right eye (RE) having a normal VA of 6/6. A relative afferent pupillary defect (RAPD) was noted in the LE. Fundus examination revealed an edematous optic nerve head (ONH) with tortuous retinal veins and multiple haemorrhages scattered throughout the retina of the LE. Optical coherence tomography (OCT) of the macula showed massive intraretinal fluid (IRF) with a central macular thickness (CMT) of 779 µm, consistent with CME.

His laboratory results, including coagulation factors, were unremarkable. His blood pressure was 180/120 mmHg, and he was diagnosed with uncontrolled hypertension. The patient was prescribed amlodipine 10 mg once daily and candesartan 16 mg once daily. No antiplatelet or anticoagulant therapy was initiated by the internal medicine team. Given the severity of the CME and CRVO, the decision was made to perform a single intravitreal injection of bevacizumab (1.25 mg) in the LE.

At the 1-month follow-up, the patient reported significant improvement in his vision. The visual acuity of the LE had improved to 6/18, and the RAPD was no longer present. Fundus examination revealed a normal optic nerve head with tortuous veins and the resolution of hemorrhages. Macular OCT showed a marked reduction in the IRF, with a CMT of 240 µm, indicating significant resolution of the CME.

Given the substantial improvement, the decision was made to discontinue further injections. At the 6-month follow-up, the patient's visual acuity and CMT remained stable, and no further interventions were required. There were no complications reported during the follow-up period.

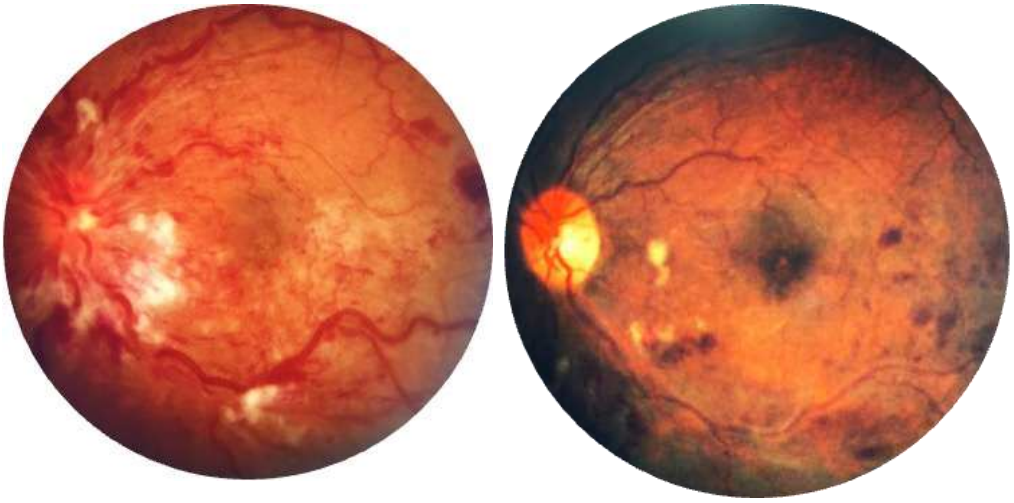

Figure 1. Funduscopy of the left eye (A) At initial presentation, with visual acuity of 1/60, showing an edematous optic nerve head (ONH), tortuous retinal veins, and multiple hemorrhages scattered throughout the retina. (B) At the 1-month follow-up after a single bevacizumab injection, with an improvement in visual acuity of 6/18, funduscopy showed a normal ONH, persistent venous tortuosity, and resolution of hemorrhages

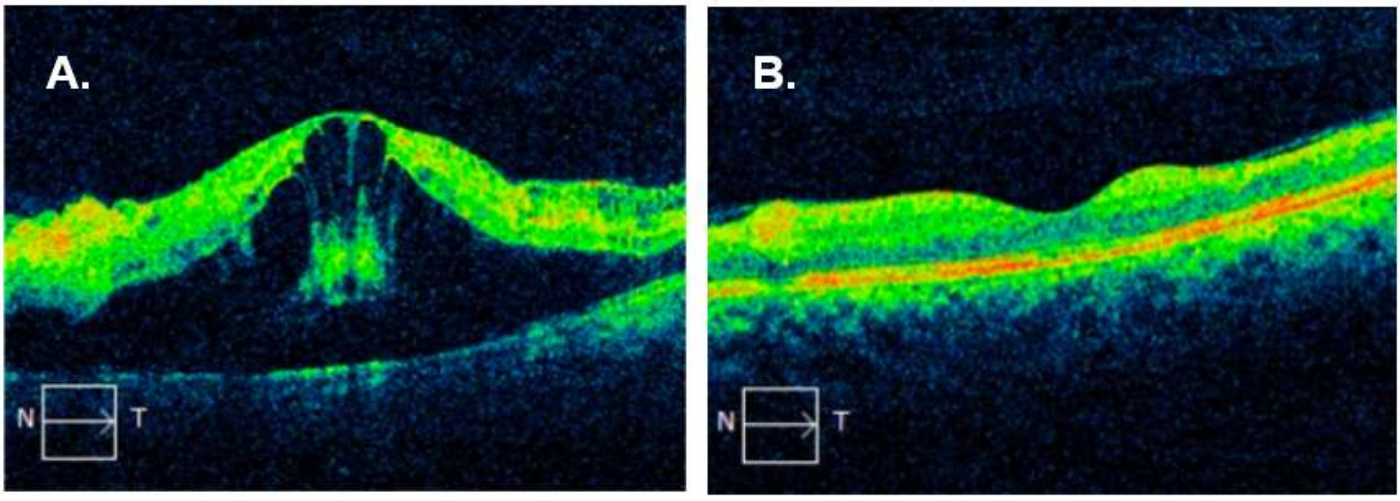

Figure 2. Optical Coherence Tomography (OCT) of the left eye. (A) At initial presentation, showing a central macular thickness (CMT) of 779 µm with massive intraretinal fluid (IRF). (B) At the 1-month follow-up after a single bevacizumab injection, with an improved CMT of 240 µm, with a marked reduction in the IRF.

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DISCUSSION

The European Society of Retina Specialists (EURETINA) recommends intravitreal injection of anti-VEGF drugs as the primary treatment for macular edema secondary to RVO, whether arising from CRVO or BRVO origins. Treatment should begin promptly upon detection, with monthly injections for at least three months, until vision acuity stabilizes. There is ongoing debate regarding the optimal regimen, specifically whether to follow a 3+ PRN or a 6+ PRN approach. However, due to the short half-life of anti-VEGF agents and the continuous intraocular release of VEGF, repeated injections are often necessary to maintain therapeutic drug levels.[8,9]

Multiple Randomized controlled trials (RCTs) have demonstrated the efficacy and safety of various anti-VEGF for treating macular edema secondary to CRVO, including ranibizumab in the CRUISE study and aflibercept in GALILEO and COPERNICUS.[10–12]However, these approved anti-VEGF treatments are costly and require an intensive regimen of monthly injections for the first six months. These frequent intravitreal injections can place a significant burden on both patients and healthcare providers. Consequently, in real-world clinical practice, bevacizumab is often used off-label as a more cost-effective alternative.

Bevacizumab, a humanized monoclonal antibody targeting VEGF-A, has demonstrated efficacy in treating macular edema secondary to RVO.[13–16] The prospective SCORE2 study found that monthly treatment with either aflibercept or bevacizumab for the first six months produced comparable morphological and visual outcomes in RVO macular edema, establishing the noninferiority of bevacizumab to aflibercept.[15,16] Additionally, research has shown that bevacizumab injections can lead to both functional and anatomical improvements in the eye with macular edema due to CRVO.[17]

In this present case, we initially planned to follow the T&E regimen, starting with at least three consecutive monthly bevacizumab injections until disease inactivity was achieved. This would be followed by gradually extending the treatment interval by 2 to 4 weeks, depending on clinical stability. However, after a single injection, the patient showed remarkable clinical improvement, with visual acuity improving from 1/60 to 6/18, and with macular OCT revealing complete resolution of IRF. Given this favorable response, we transition to a PRN approach, administering bevacizumab only when necessary. This shift not only minimized the treatment burden but also aligned with real-world scenarios where patients often receive fewer injections than in RCTs due to practical challenges, including reduced motivation after improvement, limited access to healthcare facilities, and financial constrain.

The use of a single intravitreal injection of bevacizumab for treating CME secondary to CRVO has been explored in various studies, highlighting its potential effectiveness. A retrospective cohort study involving 96 patients with ischemic CRVO compared outcomes between those who received a single intravitreal bevacizumab injection as primary treatment and those treated with monthly injections for three months. While the monthly injections group showed greater improvement in visual acuity, both treatment approaches positively impacted final visual outcomes. Interestingly, the timing of the treatment appeared to be more critical than the number of injections. Patients who received a single bevacizumab injection within one month of the CRVO event demonstrated better visual acuity improvement than those who received three injections starting more than two months after the event. Additionally, patients treated with a preset protocol of three injections achieved better outcomes than those who received additional injections on an as-needed basis. Delayed treatment, defined as injections administered more than three months after CRVO onset, was ineffective in either treatment group.[6]

Another retrospective cohort demonstrated that a single injection of bevacizumab within 18 days from onset resulted in significant reductions in CME and improvement in visual acuity at one-month post-injection. Although benefits appeared to diminish over time, the initial response was promising, suggesting that early intervention may be crucial for maximizing visual outcomes.[18] Shah et al, conducted a non-randomized interventional study evaluating the efficacy of early single intravitreal injection of bevacizumab in CRVO patients. This was followed by pan-retinal and macular grid photocoagulation, with all patients receiving treatment within seven days of presentation. All patients showed rapid improvement characterized by clearance of retinal hemorrhage, decreased disc swelling, venous dilatation, and tortuosity as early as 8 days post-injection. All patients experienced improvements in visual acuity after injection.[19] In a study by Preti et al, patients receiving a single intravitreal injection of bevacizumab exhibited statistically significant improvements in BCVA and reductions in central retinal thickness during the first month following injection. However, this was noted when the onset of injection occurred 37 weeks after CRVO onset with initially poor visual acuity.[7] Supporting these findings, another report demonstrated early and clinically relevant benefits from bevacizumab injections for CME due to CRVO. In that study, visual acuity improved and macular edema decreased after a single injection in most treated patients as early as one week visit, with statistically significant visual acuity improvements sustained through the 4 months. Furthermore, some eyes that did not initially improve after a single injection showed improvement following a second injection, suggesting that multiple injections may be beneficial in cases that do not initially respond to single injection therapy.[20]

In this case, a single intravitreal bevacizumab injection was sufficient to achieve resolution of the macular edema and visual improvement, and no retreatment was required throughout the follow-up period. In cases of CME secondary to CRVO under a PRN regimen, retreatment decisions are primarily guided by clinical signs and OCT findings. The Lucentis, Eylea, Avastin in Vein Occlusion (LEAVO) trial demonstrated that retreatment under PRN regimen was based on central subfield thickness (CST) and VA changes. Re-injection was required in eyes with a CST of 320 µm or greater, or an increase of 50 µm from the lowest recorded CST. Additionally, a decline in BCVA, typically defined as a loss of 5 or more ETDRS letters, attributed to recurrent macular edema, also prompted re-injection. [16,21]

In addition, systemic control plays a critical role in CRVO management beyond ocular interventions. In this case, the patient presented with hypertensive urgency (blood pressure 180/120 mm Hg), which is a well-established risk factor for both the onset and severity of CRVO. The prevalence of RVO is higher in individuals with hypertension compared to normotensive.[22–24] Moreover, effective blood pressure control has been shown to reduce the risk of RVO recurrence and involvement of the fellow eye. [23,25] This finding highlights the importance of early diagnosis and managing hypertension as part of RVO care, highlighting the need for a multidisciplinary approach, involving internists or cardiologists to optimize blood pressure control.

In summary, while single intravitreal bevacizumab is an effective treatment for CME secondary to CRVO, careful consideration should be given to timing when initiating therapy, especially since our case involved intervention just 10 hours post-onset. Early intervention appears crucial for optimizing patient outcomes. However, it is equally important to address any underlying systemic conditions that may contribute to vascular health issues. Further research is necessary to establish definitive protocols regarding optimal timing and frequency of interventions for various patient populations.

CONCLUSION

Single intravitreal bevacizumab is an effective treatment for CME secondary to CRVO, particularly when administered promptly. Early treatment appears crucial for optimizing outcomes, but the decision to use the T&E and PRN regimen should be guided by the patient's clinical improvement. Additionally, any systemic conditions related to the vascular condition must also be addressed and treated. Further studies are needed to confirm the optimal timing and frequency of injections and to establish standardized protocols for managing CRVO effectively.[7]

Declaration of Patient Consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patients have given their consent for their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity.

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Conflict of Interest

There is no conflict of interest

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