Medical Readiness After Retinal Vein Occlusion: A Case Review

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Case Report

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Abstract

Background: Retinal vein occlusion occurs in people 30 years of age and older. In the Army population this age range encompasses many senior leaders.

Case presentation: This article will review the case of a 45-year-old male who presented with painless visual changes of the left eye and was diagnosed with central retinal vein occlusion. The patient received prompt referral to Ophthalmological services and was started on therapy within 1 day of presentation. His course of therapy included treatment with brimonidine and monthly intravitreal injections of bevacizumab. Visual acuity improved from 20/70 at presentation to 20/25 after 4 months and visual field deficit of 50% also improved. He received panretinal photocoagulation to reduce risk of neovascularization and deployed with his unit 4 months after presentation. His course of therapy is reviewed, and available treatment options are discussed.

Conclusions: As an Active duty soldier, this patient was at risk of separation from service or being deemed non-deployable due to potential for long term visual deficits. These consequences were avoided due to immediate referral to Ophthalmology services and prompt initiation of therapy. Treatment of patients presenting with retinal vein occlusions should follow a similarly timed treatment regimen.

Background

Retinal vein occlusion (RVO) is the second most common retinal vascular pathology after diabetic retinopathy.¹ It occurs in people aged 30 years and older and increases with age. The pooled five-year incidence of any RVO is 0.86% and it is 1.63% for the pooled ten-year incidence.¹ For ages 30–39 years, prevalence is 0.26% and for ages 80–89 prevalence is 3.39% with no significant difference between sexes.¹ In the military, approximately 25% of the population is in the age range at risk for retinal vein occlusion.² Swift diagnosis and initiation of therapy can prevent complications such as long term visual deficits. Treatment of Army soldiers should follow a swift timeline to prevent service limiting conditions.

Case Presentation

A 45-year-old Active duty male presented to his primary care clinic with 5 days blurred and decreased vision in the lateral inferior aspect of the left eye. He initially noticed symptoms of dimness and decreased color while driving. Symptoms at presentation also included pressure in and around the affected eye. He denied erythema, pruritis, or tenderness of the eye and did not endorse a history of flashes of light, black curtain in field of vision, sensitivity to light, or double vision. The patient also denied recent illness, headache, difficulty in balance, or change in motor movements and did not have a history of prior eye trauma or surgery. He had a remote history of mild traumatic brain injury but was cleared without sequela. He was a former tobacco user and consumed alcohol once per week. Vitals at presentation were blood pressure of 128/88; heart rate of 76; temperature of 98.4°F; and respiratory rate of 14. Uncorrected visual acuity was OD: 20/30, OS: 20/70, and OU: 20/20. Physical exam revealed normal exam of the pupils,

external eye, and sclera. Ophthalmoscope provided limited evaluation of the optic discs and retinal vessels but those visualized were normal. Visual field exam revealed a deficit in lower half of the left visual field with patient able to detect movement only. There was no change to upper half of left visual fields. He was able to see a clock on the exam room wall clearly with binocular vision but could not make out hand placement with isolated left eye vision.

The patient was referred to ophthalmology with initial evaluation the following morning. Retinal exam with slit lamp showed cup to disc ratio of 0.4 OD and 0.2 OS with signs of branch retinal vein occlusion of the inferior temporal vessels. The patient was referred to a retinal specialist who requested laboratory evaluation, including CBC, coagulation panel, ESR, homocysteine, lipids, glucose, and serum viscosity. All lab results were normal.

The retinal specialist saw the patient the same day. A dilated exam resulted in a diagnosis of a mildly ischemic central retinal vein occlusion. He was started on brimonidine 0.1% drops twice per day with follow up in 7 days. Exam one week later showed increased macular edema with no reported change in symptoms. Brimonidine was discontinued and patient received bevacizumab 25 mg inferotemporal injection 3 days later. Bevacizumab injections continued monthly until the patient's 4 months follow up. Visual acuity at that visit was 20/25 although angiogram showed significant continued ischemia placing the patient at high risk for rubeosis. The retinal specialist performed panretinal photocoagulation therapy to reduce risk of rubeosis and the patient departed for deployment two weeks later.

Discussion

Retinal vein occlusion is classified as central retinal vein occlusion (CRVO) or branch retinal vein occlusion (BRVO). CRVO is further classified as non-ischemic versus ischemic. Non-ischemic type constitutes 81% of CRVO cases while ischemic type is 19% of cases.³ Ischemic CRVO has a poor prognosis compared to non-ischemic type. Risk factors include increasing age, hypertension, open-angle glaucoma, diabetes mellitus, and hyperlipidemia; while smoking, hypercoagulable state, sickle cell, abnormal platelet function, and contraceptive use are less common risk factors.⁴ The above patient's only known risk factor was a history of smoking. While a specific cause of retinal vein occlusion has not been identified, it is known to develop due to a blood clot or poor flow in the central retinal vein that is responsible for drainage of the retina.⁵ Retinal vein occlusion is usually present in one eye only; inclusion of both eyes is associated with a systemic illness.⁵

As with the patient above, patients with retinal vein occlusion present with sudden painless decreased or distorted vision in the affected eye.⁴ Complaints range from vague visual changes to significantly reduced vision.⁴ Other complaints such as decreased extraocular movements, muscle weakness, ptosis, or paresthesia are not associated with retinal vein occlusion and suggest another diagnosis.⁴

Physical exam ranges from relatively normal to changes in color vision, visual acuity, and afferent pupillary defect.⁴ The above patient's symptoms included painless vision loss with changes in visual

fields making his symptoms consistent with retinal vein occlusion presentation. In many patients a fundus exam may show classic “blood and thunder” appearance, cotton wool spots, swelling of the optic disc, retinal edema, venous dilation, or hemorrhage in all four quadrants.⁴ This patient’s exam showed changes in the optic disc. Evaluation of patients with central retinal vein occlusion often includes blood pressure, erythrocyte sedimentation rate, complete blood count, random blood glucose, total and HDL cholesterol, plasma protein electrophoresis, thyroid function tests, renal function test, and electrocardiogram.⁴ Laboratory evaluation aims to identify potential causes and conditions that could lead to complications.

To understand the importance of prompt therapy, an understanding of possible complications associated with retinal vein occlusion is necessary. Complications of non-ischemic central retinal vein occlusion include chronic macular edema which causes cystoid macular degeneration and leads to permanent central scotoma with normal peripheral visual fields.⁴ About 12% of eyes with non-ischemic retinal vein occlusion convert to ischemic pathology within 18 months.³ This change occurs more often in older patients.

Our patient was ultimately diagnosed with ischemic central retinal vein occlusion. Ischemic CRVO causes hypoxemia of the retina leading to release of vascular endothelial growth factor (VEGF) and other inflammatory mediators.⁴ In the presence of VEGF, approximately 50% of patients develop neovascularization of the iris, known as rubeosis iris, within 2–4 months of diagnosis.⁴ New vessels within the eye clog the drainage of normal eye fluids leading to neovascular glaucoma.⁵ The risk of rubeosis was the primary long term concern for the above patient since neovascular glaucoma is associated with severe visual impairment and blindness and is regarded the most severe complication of CRVO.⁶ Ischemic CRVO is also associated with vitreous hemorrhage, macular degeneration, optic atrophy, retinitis proliferans, and phthisis bulbi.³

Management of central retinal vein occlusion depends on non-ischemic versus ischemic disease. Since ischemic disease is associated with neovascular glaucoma, the retinal specialist chose a treatment regimen aimed at preventing or controlling it. It is worth noting that multiple therapies have been used in the management of retinal vein occlusion but there is no current consensus on what course of treatment is best.^{3,4}

The retinal specialist could have started treatment with aspirin and other antiplatelet or anticoagulation therapies that are used to reduce thrombi that lead to retinal vein occlusion.^{3,4} However, these medications are not widely chosen unless the patient has another condition where anticoagulation is indicated. When used in patients with RVO, anticoagulant medications can result in increased retinal hemorrhage that further damage the eye.³

Systemic and intravitreal corticosteroids were a possible option as they have been shown to reduce macular edema in some patients with non-ischemic pathology. However, corticosteroids do not work for every patient and have not shown benefit in patients with ischemic CRVO.³ Patients who do respond

require high dose systemic steroids for several months with long term therapy at lower doses for several years to prevent return of macular edema and deterioration of vision.³ Of note, intravitreal corticosteroid injections have not shown significant difference in outcome when pre-injection visual acuity was compared to post-injection vision³ making it a less desirable treatment option for the patient.

Topical ocular hypotensive medications can be used to lower pressure in eyes with increased intraocular pressure. Retinal vein occlusion is not associated with increased intraocular pressure unless it progresses to glaucoma.³ When glaucoma or ocular hypertension are present, treatment with ocular hypotensive medications is applied to both eyes to reduce the risk of CRVO development in the unaffected eye.³ The retinal specialist chose brimonidine because it is a selective α -adrenergic receptor agonist that lowers intraocular pressure; while it is primarily used in treatment of chronic glaucoma⁷ it has an off label indication for treatment of retinal vein occlusion. It has also proven beneficial in reduction of intraocular pressure following intravitreal injection of anti-vascular endothelial growth factor (anti-VEGF) agents.⁸

Treatment of central retinal vein occlusion most often involves intravitreal injection of anti-VEGF agents to reduce new blood vessel growth and swelling.³⁻⁵ These agents include bevacizumab (Avastin), ranibizumab (Lucentis), and aflibercept (Eylea) and often require several injections over a period of several years. While the patient only received 4 months of therapy, he showed significant improvement of visual acuity in that time frame.

If the patient did not response to the chosen treatment options, he could have undergone surgical decompression of the central retinal vein, known as a radial optic neurotomy. This procedure restores blood flow in the vessel but some ophthalmologists believe the procedure does not achieve improved flow and is potentially harmful.³ Another surgical option could have been a pars plana vitrectomy which clears hemorrhage allowing better visualization of the retina; it can also be used to ablate neovascularization and prevent development of neovascular glaucoma.⁴

The retinal specialist ultimately chose panretinal photocoagulation (PRP) to treat the patient's central retinal vein occlusion. PRP is the treatment of choice in ischemic central retinal vein occlusion. It devitalizes retinal tissue to prevent neovascularization within the eye and decreases the risk of severe vascular complications. By preventing neovascularization of the retina, optic disc, and iris, PRP reduces risk of neovascular glaucoma, macular edema, increased macular thickness, elevated intraocular pressure; and changes of the visual field.⁶ PRP also increases blood flow to eyes with ischemic disease⁶ making it a good option for our patient.

Prognosis for patients with central retinal vein occlusion varies with age. Younger patients tend to have improvement of visual deficits with time.^{3,5} While this may have been the case with the above patient, he had an upcoming deployment that curtailed the time he was available for treatment, preventing clinical monitoring, and increasing his risk of complications. Because he received immediate referral to Ophthalmology, macular edema was promptly identified. Early identification of macular edema and neovascularization is shown to prevent vision loss when treatment is not delayed.⁵ Due to the potential for

decreased visual acuity and visual field deficits as described previously, the choice to forego therapy is not advised in the Army population.

Army soldiers are required to maintain specific health standards as defined in AR 40–501: Standards of Medical Fitness. Soldiers who cannot meet these standards due to illness or injury are subject to separation from service through administrative channels or the Integrated Disability Evaluation System.⁹ Although retinal vein occlusion is not specifically mentioned in AR 40–501, visual acuity and visual fields are. Soldiers must have visual acuity of at least 20/40 in one eye and 20/100 in the other; 20/30 in one eye and 20/200 in the other; or 20/20 in one eye and 20/800 in the other.⁹ In eyes with active or progressive eye disease, visual acuity standards must be met and visual fields must be greater than 20 degrees in the eye with better vision.⁹ Vision must be correctable with glasses as contact lenses are not authorized.

Deploying soldiers are further required to meet theater specific medical standards. Most soldiers deploy to the US Central Command (USCENTCOM) area of responsibility and are subject to the requirements of the most current modification to USCENTCOM Individual Protection and Individual-Unit Deployment Policy. MOD 15 Tab A requires that visual acuity meet requirements to safely perform occupational duties and be deemed safe by an examining provider.¹⁰ Soldiers with retinal vein occlusion are subject to these requirements. Those receiving treatment for retinal vein occlusion would not be able to deploy while receiving injectable medications.

Among active duty Army soldiers approximately 30%, aged 30 years and older, smoke and approximately 5.6% have hypertension.¹¹ Of the risk factors for retinal vein occlusion, smoking, hypertension, diabetes mellitus, and hyperlipidemia are routinely screened for during annual period health assessments and prior to school attendance, making them easy to identify and correlate. In the active duty Army population, many soldiers in the age range at risk for retinal vein occlusion hold higher ranks or key positions. An index of suspicion for retinal vein occlusion is warranted in soldiers who present with changes in vision and who also have risk factors.

Conclusions

The soldier described above presented with signs and symptoms concerning for retinal vein occlusion. He was promptly referred to an Ophthalmologist which allowed evaluation by a retinal specialist within one day of presentation. Swift initiation of therapy reduced his chances of long-term visual deficits and complications such as neovascularization. Although, he only received treatment for four months prior to his deployment, his visual acuity and visual field deficits had improved, allowing him to remain on active duty and safely deploy. Medical providers should follow a similar treatment timeline in Army patients with retinal vein occlusion to ensure therapy begins as quickly as possible.

Abbreviations

RVO - Retinal vein occlusion

OD – Oculus Dexter (right eye)

OS – Oculus Sinister (left eye)

OU – Oculus Uterque (both eyes)

CRVO - Central retinal vein occlusion

BRVO - Branch retinal vein occlusion

VEGF - Vascular endothelial growth factor

PRP - Panretinal photocoagulation

USCENTCOM – US Central Command

Declarations

Ethics approval and consent to participate

Not applicable

Consent for publication

Written informed consent for publication of their clinical details and/or clinical images was obtained from the patient. A copy of the consent form is available for review by the Editor of this journal.

Availability of data and materials

Not applicable

Competing interests

The authors declare that they have no competing interests

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Authors' contributions

LM obtained all patient information and conducted all literature review.

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References

1. Song P, Xu Y, Zha M, Zhang Y, Rudan I. Global epidemiology of retinal vein occlusion: a systematic review and meta-analysis of prevalence, incidence, and risk factors. *Journal of Global Health*. 2019;9(1). doi:10.7189/jogh.09.010427
2. *Health of the Force 2019: Create a Healthier Force for Tomorrow*. Accessed August 21, 2020. https://phc.amedd.army.mil/PHC Resource Library/2019_Health-of-the-Force-webenhanced.pdf
3. Hayreh S. Central retinal vein occlusion. University of Iowa Carver College of Medicine. Published 2016. Accessed August 2, 2020. <https://eyerounds.org/article/CRVO/>
4. Blair K, Czyz C. Central retinal vein occlusion. StatPearls [Internet]. Published 2020. Accessed August 2, 2020. <https://www.ncbi.nlm.nih.gov/books/NBK525985/>
5. Bakri S, Berrocal A, Capone A, et al. Central retinal vein occlusion. The American Society of Retina Specialists. Published 2016. Accessed August 2, 2020. <https://www.asrs.org/patients/retinal-diseases/22/central-retinal-vein-occlusion>
6. Li C, Wang R, Liu G, et al. Efficacy of panretinal laser in ischemic central retinal vein occlusion: a systematic review. *Experimental and Therapeutic Medicine*. 2019;17(1):901-910. doi:10.3892/etm.2018.7034
7. Nucci C, Martucci A, Giannini C, Morrone LA, Bagetta G, Mancino R. Neuroprotective agents in the management of glaucoma. *Eye*. 2018;32(5):938-945. doi:10.1038/s41433-018-0050-2
8. Felfeli T, Hostovsky A, Trussart R, Yan P, Brent M, Mandelcorn E. Hypotensive efficacy of topical brimonidine for intraocular pressure spikes following intravitreal injections of antivascular endothelial growth factor agents: a randomised crossover trial. *British Journal of Ophthalmology*. 2019;103(10):1388-1394. doi:10.1136/bjophthalmol-2018-312603
9. Army regulation 40-501: standards of medical fitness. Department of the Army.
10. MOD 15-Tab A: amplification of the minimal standards of fitness for deployment to the CENTCOM AOR; to accompany MOD Fifteen to USCENTCOM individual protection and individual/unit deployment. United States Central Command. Published 2020. Accessed July 23, 2020. <https://www.atterburymuscatatuck.in.ng.mil/Portals/35/Documents/Training/MOD15TabAFinal.pdf?ver=2020-04-24-142034-497>
11. *2019 Health of the Force*; 2020. https://phc.amedd.army.mil/PHC Resource Library/2019_Health-of-the-Force-webenhanced.pdf