



Laser Pan-Retinal Photocoagulation to Treat Central Retinal Vein Occlusion

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Abstract

Introduction. Retinal Vein Occlusion (RVO) is the second most common retinal blood vessel disease after diabetic retinopathy. CRVO is an acute blockage of the central retinal vein that causes abnormalities in the retina, characterized by sudden decreased vision. Based on the potential for vision loss from this retinal disease, proper diagnosis and management is needed to prevent further complications.

Case Presentation. A man, age 50 years old, a civil servant, came to the eye clinic of Mohammad Hosein Hospital on February 2017. The main complaint was vision of right eye suddenly blurred since 5 months before. Based on the above examination found decreased vision in one eye, with visual acuity better than 6/60 and no RAPD. The funduscopy examination above shows the presence of dilatation and tortuosity in the central retinal vein, dot / blot bleeding and flame shaped hemorrhages in all quadrants, exudates, neovascularization of the retina and optic disk, and the presence of edema in the optic disc and macula.

Conclusion. Management performed on these patients is by performing a Pan-Retinal Photocoagulation (PRP) laser and Grid-Pattern Photocoagulation. The selection of this therapy is based on the consideration that the patient has been suffering from CRVO for more than 3 months.

Keywords: central retinal, vein occlusion, laser pan-retinal, photocoagulation.

Introduction

Retinal Vein Occlusion (RVO) is the second most common retinal blood vessel disease after diabetic retinopathy. RVO can be divided into 2 categories depending on the occlusion area, namely Retinal Branch Vein Occlusion (BRVO) and Central Retinal Vein Occlusion (CRVO). Predisposing factors on the emergence of RVO itself is based on a variety of pathological conditions both systemic and local.¹

Unhealthy lifestyle and patterns such as an unbalanced diet, lack of exercise and age can increase the risk of diseases such as hypertension, hyperlipidemia and diabetes. These diseases can cause venous occlusion in the retina including BRVO and CRVO. Both are estimated to occur in 180,000 eyes per year in the United States in 2013, which makes it the second most common cause of retinal vascular abnormalities after *diabetic retinopathy*. BRVO occurs in about 80 percent of this amount but CRVO is a cause of significant vision loss compared to BRVO. Thus, CRVO has the potential to cause serious vision damage.²⁻⁵

CRVO is an acute blockage of the central retinal vein that causes abnormalities in the retina, characterized by sudden decreased vision. Based on the potential for vision loss from this retinal disease, proper diagnosis and management is needed to prevent further complications.

Reported an old case of central retinal vein occlusion which was treated with Laser Pan-Retinal Photocoagulation (PRP).

Case Report



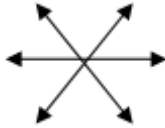
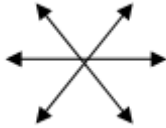
A man, Mr. A, age 50 years old, having an address outside the city, working as a civil servant, came to the eye clinic of Mohammad Hosein Hospital on February 1, 2017. Anamnesis main complaint is Main Complaints: Vision of right eye suddenly blurred since, 5 months which then.

The history of the disease Since, 5 months ago, sufferers complained that right eye gaze suddenly felt blurred. Patients also complain of frequent headaches without nausea and vomiting before the vision in his right eye becomes blurred. History is like seeing a flash of light refuted. Visions such as closed curtains are denied, red eyes are denied, seeing objects or objects become incomplete or the existence of a dark part of the sight is denied. The patient then went to the Regional Hospital and was referred to Mohammad Hoesin Hospital.

Past medical history, history of hypertension (+) since 6 years ago (irregular control), History of hyperlipidemia (+) since 3 years ago (not regular control), History of diabetes is denied, History of smoking since 25 years ago (\pm 1 - 2 packs of filter cigarettes per day), History of trauma was denied, history of wearing glasses was denied, history of using drugs for a long time was denied, family history with the same complaints was denied.

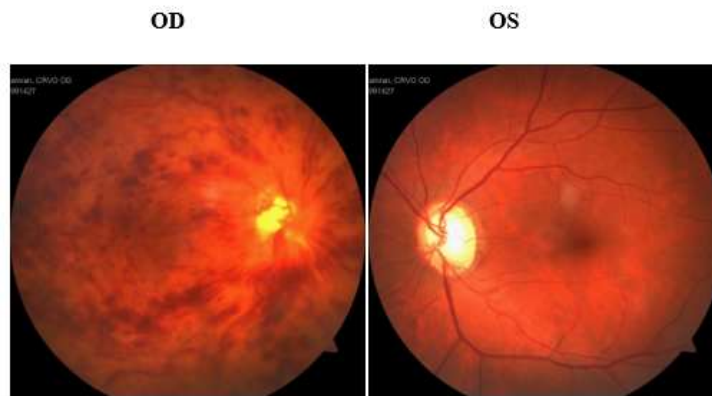
General examination of generalist status General state: Moderate illness, awareness: Compost mentis, blood pressure: 150/90 mmHg, pulse: 80 x / minute, respiration: 24 x / minute, temperature: 36.5 ° C, BMI: 27.34 kg/m² (Normal: 18.5 - 24.9 kg / m²).

Ophthalmic status table

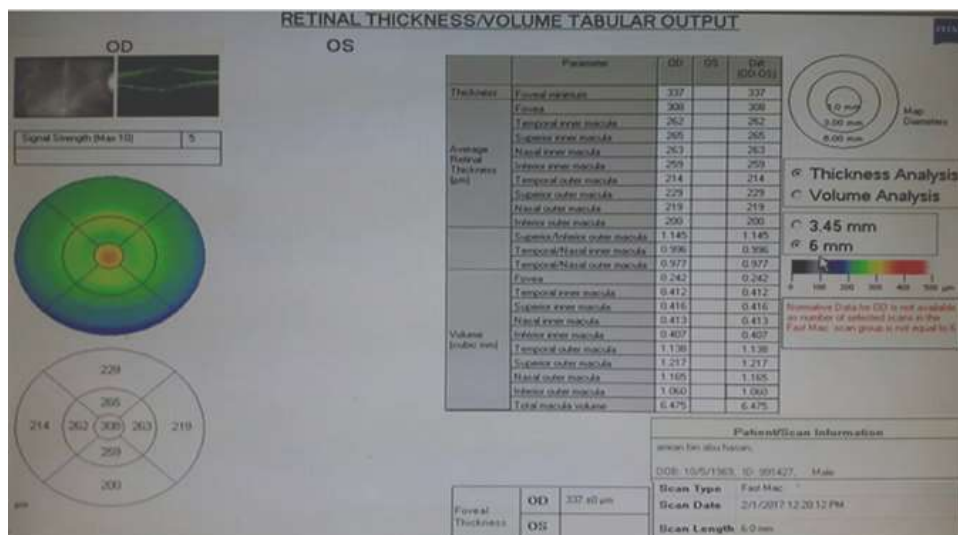
	OD	OS
		
Vision	6/21 Ph -	6/6
Intra ocular pressure	18,5 mmHg	18,5 mmHg
Eyeball position	Ortoforia	
Eyeball movement		
Palpebra	Quiet	Quiet
Conjunctiva	Quiet	Quiet
Cornea	Clear	Clear
Front-eye booth	Medium	Medium
Sliced	Good picture, sliced neovascularization (-)	Good picture, sliced neovascularization (-)
Pupil	Round, central, RC (+), Ø 3 mm, RAPD (-)	Round, central, RC (+), Ø 3 mm, RAPD (-)
Lens	Clear	Clear
Posterior Segment	RFOD (+)	RFOS (+)
Papil	Blurred limits, c / d difficult to assess, a / v 1:3, peripapillary bleeding (+), neovascularization (+)	Round, firm boundary, red color, c / d 0.3 a / v 2:3

Macula	RF (+) ↓, edema (+)	RF (+) N
Retina	Bleeding in 4 quadrants (+), dot (+), blot (+), vascular sclerotic (+), flame shape (+), exudate (+), venous dilatation (+), tortuous (+), neovascularization (+)	Good blood vessel contour

Fundus photo supporting examination

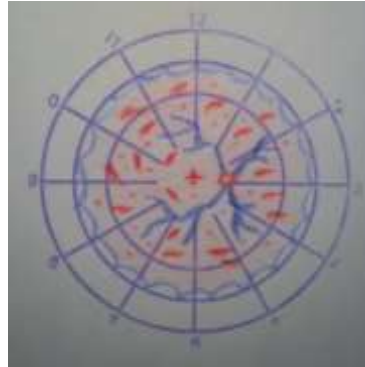


Macula OCT examination results



OCT Interpretation of Fovea retinal thickness: $337 \pm 0 \mu\text{m}$, Central Zone: $306 \mu\text{m}$, Perifoveal: $262 - 263 \mu\text{m}$. Fovea depression disappears, hypo-reflectivity in the subretinal region, Vitro-Retinal Interface. Impression: macular edema.

Drawing of Oculi Dextra's retinal



Laboratory examination results table

Examination	Result	Reference	Unit
Hematologist			
Hemoglobin (HGB)	15,7	13,48-17,40	g/dl
Erythrocytes (RBC)	5,17	4.40-6.30	10 ⁶ / mm ³
Leukocytes (WBC)	7,8	4,73-10,89	10 ³ / mm ³
Hematocrit	48	31-51	%
Platelets (PLT)	337	170-396	10 ³ / ul
LED	12	< 15	mm/hour
Bleeding time	2	1-3	Minute
Freezing time	10	9-15	Minute
Glucose on the time	99	< 200	mg/dl
Fasting Glucose	93	70 - 120	Mg/dl
Hb-A1c	4,9	4,0 – 6,5	%
Calculate type			
B/E/Nb/Ns/L/M	0/1/74/59/16/9		%
Clinical Chemistry			
Total cholesterol	220	< 200	mg/dl
HDL cholesterol	47	> 55	mg/dl
LDL cholesterol	118	< 100	mg/dl
Triglycerides	104	< 150	mg/dl
Ureum	19	15 - 39	mg/dl
Creatinine	0.93	0.6 - 1.0	mg/dl

Thorak PA X-ray imaging



Impression: No radiological abnormalities were seen on Thorax photo

Differential diagnosis of non-ischemic CRVO type Oculi Dextra + macular edema oculi Dextra, Ocular Ischemic Syndrome, Hyper-viscosity Retinopathy oculi dextra. The working diagnosis of non-ischemic CRVO type Oculi Dextra + macular edema Oculi Dextra.

Management is informed consent, Pro counsel for Internal Medicine, Pro FFA examination (Fluorescein Fundus Angiography), Pro laser Pan-Retinal Photocoagulation and Laser Grid Pattern photocoagulation oculi dextra. Prognosis of Quo ad vitam: Bonam, Quo ad functionam: Dubia ad bonam, Quo ad sanationam: Dubia ad bonam.

Discussion

One case was reported of a man, aged 52 years with the main complaint of a blurred right eye since, 5 months ago. Based on the history obtained, complaints of vision of his right eye suddenly blurred since, 5 months ago to feel dark without any pain.

Based on Ikuo Tobari's research in the Journal of Japan Medical Association entitled Central Retinal Vein Occlusion (CRVO) - Visual Disorder in Patients of Middle and Advanced Age in 2001 mentioned that CRVO generally occurs in patients aged 50-69 years and almost 90% of all sufferers CRVO occurs at the age of 50 years or more where it is more common in men.²⁰ Patients say that they have been suffering from hypertension since 6 years ago, cholesterol 3 years ago and have a history of smoking since 25 years ago. Based on this, the patient is subjected to laboratory examinations and X-ray Thorax to determine what systemic conditions or abnormalities may be

related to complaints in his eyes at this time. From the consul's response from the Internal Medicine section patients suffering from grade 1 hypertension and hyperlipidemia which is supported by the results of anamnesis, physical and laboratory examination. Based on research conducted by M. Rehak and P. Wiedemann in the Journal of Thrombosis and Haemostasis entitled Retinal Vein Thrombosis: pathogenesis and management in 2010 which states that most patients with CRVO occur in older age and more than half are associated with systemic diseases. There is evidence that an increased risk of developing CRVO in patients with vascular arteriosclerotic systemic disease is seen in patients with hypertension, diabetes mellitus, dyslipidemia, high body mass index and smoking. CRVO occurs in the lamina cribrosa area. In this area veins and arteries coexist and are wrapped by adventitious layers. Therefore, mechanical narrowing of the thin walls of the venous lumen caused by arteriosclerosis associated with hardening and thickening of the arterial wall causes urgency to the retinal veins, arising turbulence in blood flow and causing injury to the venous endothelium that triggers occlusions and thrombus formation in veins.²¹ According to Laksmana M. Kooragayala in his journal entitled CRVO in 2016, mentioning occlusion in the central retinal vein causes blood to remain in the retinal vein system and increases resistance to venous blood flow. This increased resistance causes blood stagnation and can cause ischemic damage to the retina.⁸ According to a recent study from Marianne Shahsuvaryan in her journal entitled *Systemic Hypertension and the Eye: Highlighting a comorbidity* in 2016 mentioned hypertension is a trigger for the emergence of Retinal vein occlusion (RVO) and the impact of the duration of systemic hypertension on the frequency of RVO is proven to be directly increasing cases of RVO in patients those suffering from hypertension 5-10 years and the impact is more evident in the duration of more than 10 years.²²

According to Mehmet Citirik in the *International Journal of Ophthalmic Research in Clinical Risk Factors Underlying the Occurrence of Retinal Vein Occlusion* in 2016 and many relevant studies say there is a significant relationship between CRVO and Hyperlipidemia (HLD). In patients with hyperlipidemia have a risk of developing RVO 2 times greater than those without. Estimates of significant risk are also found in people with CRVO. HLD is a risk factor for arteriosclerosis and early HDL events are associated with increased arterial problems and then because of this disease the arteries become more rigid. The duration and severity of HDL can affect the widespread incidence of arteriosclerosis in the central retinal artery which ultimately affects the risk of CRVO.¹

Smoking is a risk factor for RVO, according to Ronald Klein in the American Journal of Ophthalmology: *The Epidemiology of Retinal Vein Occlusion: The Beaver Dam Eye Study* in 2000 states there is a strong correlation between smoking and the incidence of RVO. The relationship between smoking and this incidence is consistent with several studies that prove that smoking causes inflammatory factors that influence the onset of RVO.²³

In this patient, body mass index is not ideal. Body mass index (BMI) is calculated using weight in kilograms divided by the square of height in meters. According to David J Browning in his 2011 book *Retinal Vein Occlusion* mentioned obesity which is defined as a BMI of more than or equal to 30 is a significant risk factor for the emergence of RVO. Based on research also found that patients who have a high level of body activity have a lower risk than low physical activity and are more protected for the onset of CRVO. This patient has a BMI of 27.34 kg / m², which based on the literature review above has less risk for the emergence of CRVO when viewed in terms of the patient's body mass index. However, sufferers admit that they rarely exercise and in their daily work rarely carry out strenuous activities and are accompanied by other systemic diseases causing the patient's risk for CRVO to appear higher.²³

Based on generalist status examination, blood pressure was 150/100 mmHg and Ophthalmologic status obtained VOD 6/21 Ph- and VOS 6/6, TIODS within normal limits, RAPD (-) and no neovascularization in iris. On fundoscopic examination of the right eye papillary blurry border obtained, c/d difficult to assess, a/v 1:3, peripapillary bleeding (+), on macular examination obtained decreased reflexes and on the retina bleeding in 4 quadrants (+), dot (+), blot (+), Sclerotic blood vessels (+), flame shape hemorrhages (+), exudate (+), Venous dilatation (+), tortuous (+). Based on the above examination found decreased vision in one eye, with visual acuity better than 6/60 and no RAPD. The funduscopy examination above shows the presence of dilatation and *tortousity* in the central retinal vein, dot / blot bleeding and flame shaped hemorrhages in all quadrants, exudates, neovascularization of the retina and optic disk, and the presence of edema in the optic disc and macula. The results of these examinations are characteristic of a non-ischemic CRVO type.^{14,15,24}

To confirm these findings, in this patient carried out investigations in the form of *Optical Coherence Tomography (OCT) and Fluorescein Fundus Angiography (FFA)* which is very helpful in establishing the diagnosis. Examination of FFA in these patients was found to prolong the retinal circulation time by decreasing capillary permeability with a minimum of non-perfusion (ischemic) area which is less than 10 optical disk areas is a characteristic that confirms towards

non-ischemic CRVO type. Fluorescence in the macula indicates capillary leak and edema. The pattern of a central retinal vein occlusion is usually characterized by *delayed filling time* of the venous branches in the retina, capillary and venous dilatation, and extensive leakage into the retina, specifically the macula.^{14,20,25,26}

On OCT examination the right eye found fovea depression disappeared and hypo-reflectivity in the subretinal region was obtained an impression of macular edema OD. OCT is an imaging technology that displays micron, *cross sectional*, resolution images of tissues including oculi microstructure that is useful in the assessment of macular edema, especially with macular edema *follow-up* because of its ability to quantitatively measure retinal thickness. In normal eyes the thickness of the central retina may be in the range of about 140 to 200 microns. One reason why the decline in vision in CRVO patients is the emergence of macular edema and the form of macular edema can be known in detail using OCT^{5,25,26}

Based on history and physical examination and support we can establish a diagnosis of non-ischemic Central Retina Vein Occlusion with macular oculi dextra edema.

This patient is diagnosed with *Ocular Ischemic Syndrome (OIS)* and *hyper-viscosity retinopathy oculi dextra* which have similarities with CRVO. The main sign that can help differentiate between OIS and CRVO is the absence of a retinal vein Tortuous in OIS. Examination with FFA, in OIS there is retinal artery stasis and *choroidal filling defect*, which this is not found in the case of CRVO. In *hyper-viscosity retinopathy* generally occurs bilaterally and is usually associated with dysproteinemia such as *Waldenstrom macroglobulinemia or multiple myeloma*. So, based on the results of the above examination we can get rid of the differential diagnosis.¹⁴

CRVO management in principle is to restore retinal tissue perfusion, overcome predisposing factors and prevent further complications in the form of chronic macular edema and brushes on the macula. This patient is managed by *Pan-Retinal photocoagulation (PRP)* laser treatment to overcome leakage and neovascularization of the retina and *Grid Pattern Photocoagulation* to overcome macular edema. In this patient no anti-VEGF injection or intravitreal Triamcinolone acetonide was given because it was no longer effective in reducing edema and preventing neovascularization in older CRVO cases. According to Teruyo kida et al in the journal Clinical Ophthalmology entitled *Treatment of systemic hypertension is important for improvement of macular edema associated with retinal vein occlusion* in 2014 states that VEGF inhibition for RVO cases related to macular edema is more effective in reducing edema and improving visual acuity if done in 2014 3 months after the onset of the disease. Associated with this matter based

on CRUISE research in *the Retinal Vein Occlusion (RVO) Guidelines* published by *The Royal College of Ophthalmologists* in 2015 stated that there is a relationship between the duration of macular edema and the *Visual Acuity Outcome*. Provision of anti-VEGF in patients with shorter macular edema duration will produce a better visual outcome.¹² In this patient has decreased vision for 5 months so that the administration of anti-VEGF injections intravitreal after 3 months after onset is too late and no longer effective so management with *laser photocoagulation* is the most appropriate action in this case. PRP is done to remove ischemic tissue that aims to prevent or eliminate neovascularization in the retina, iris and on the optic disk and reduce the stimulus that causes continued damage to proliferative diseases such as venous occlusion and laser *grid-pattern photocoagulation* procedures performed to reduce macular edema. *The Central Vein Occlusion Study (CVOS) Group in Management of Retinal Vein Occlusion - Consensus Documents* in 2011, tried to evaluate the benefits of *macular grid photocoagulation* to protect or improve sharp eyesight in the eye with macular edema caused by *Central Vein Occlusion (CVO)* and has the Best-Corrected Visual acuity (BCVA) 20/50 or worse. *Macular grid photocoagulation* is effective in reducing macular edema, but does not improve sharp eye sight due to macular edema caused by CVO.^{12,15, 18 27,28}

After 1 month the patient was examined and clinically improved in patients, where there was an increase in vision to 6/12 pH - and on fundal photo examination there was a decrease in retinal bleeding and reduced edema in the macula confirmed by repeated FFA examination which showed improvement with reduced *leakage* area. After the *leakage* area was identified, an additional *Pan-Retinal Photocoagulation (PRP)* laser and *Grid-Pattern Photocoagulation* laser was performed to speed up repairs in the retina and macula.

In the case of non-ischemic type CRVO has a better prognosis than ischemic type CRVO, based on the results of follow-up after 1 month there is progress in the form of improved vision and improved retinal state, is expected over time and appropriate management of underlying causes, namely hypertension and hyperlipidemia as well as the absence of further complications it is hoped that the patient's vision will be even better. Based on this, the prognosis of patients in this case is *quo ad vitam bonam* and *quo ad function dubia ad bonam*.

Conclusion

A case of a non-ischemic type of *Central Retina Vein Occlusion* (CRVO) in a man 50-year-old, came to the Mohammad Hoesin Hospital in Palembang with complaints of a sudden blurred right eye since, 5 months ago. The patient has a history of hypertension and hyperlipidemia.

The basis of diagnosis in this patient's case is based on history taking, ophthalmological examination and support. Through examination found neovascularization of the retina and edema of the macula. Management performed on these patients is by performing a *Pan-Retinal Photocoagulation* (PRP) laser and *Grid-Pattern Photocoagulation*. The selection of this therapy is based on the consideration that the patient has been suffering from CRVO for more than 3 months. Patients are also given therapy to overcome their systemic conditions to prevent worsening of the condition of their eyes and overall patient health.

In this patient, clinical improvement occurred after receiving the therapy where complaints had diminished, better vision and no further complications. So, the prognosis of this patient is *dubia ad bonam*.

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