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Management of Proliferative Diabetic Retinopathy and its Associated Conditions using *Ayurvedic* Therapies: A Case Series

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ABSTRACT

Introduction: Proliferative diabetic retinopathy (PDR), characterized by neovascularization either at the optic disc (NVD) or elsewhere (NVE), may be associated with clinically significant macular oedema (CSME) or cystoid macular oedema (CME). Tractional retinal detachment in PDR is the result of neovascularization. As conventional management of PDR may not always prove effective, alternative options, including *Ayurvedic* treatment protocols, may be sought.

Case Series: 3 diagnosed cases of PDR with associated conditions were managed using specially tailored *Ayurvedic* oral medicines, external therapies for both the eyes and head and a dietary protocol at Sreedhareeyam Ayurvedic Eye Hospital and Research Center, India. Both ocular and systemic parameters showed improvement at discharge.

Discussion: The patients' symptoms were compared to *Timira* or blurring of vision. Diagnostic parameters in *Ayurveda* were explored along the lines of pathological activity of *Tridoshas* (three somatic senses of humour - *Vata, Pitta,* and *Kapha*) and *Rakta* (blood tissue). Treatments were aimed not only at PDR and its complications, but also to normalize digestion and metabolism, thus revitalizing normal physiology. This holistic approach can make *Ayurvedic* management of PDR an option to consider..

Key Words: *Ayurveda*, Holistic approach, Case series, Herbal medicines, Macular oedema, Tractional retinal detachment

INTRODUCTION

Diabetic retinopathy (DR) is one of the leading causes of preventable blindness among the global working-age population.[1] It is slated to increase with the projected prevalence of diabetes mellitus predicted to increase to 700 million in 2045.[2] One-third of an estimated 285 million diabetics are afflicted with vision-threatening DR (VTDR).[3] Proliferative diabetic retinopathy (PDR) is the most common vision-threatening lesion among type 1 diabetics, and it presents with macular oedema in type 2 diabetics.[4] Tractional retinal detachment in PDR is a result of stimulated scar formation due to neovascularization.

Treatment options for PDR in ophthalmology, *viz.,* pan-retinal LASER photocoagulation and injection of intravitreal anti-vascular endothelial growth factors (anti-VEGF), may not prove effective in some cases. Hence, options in the realms of complementary and alternative medicine (CAM) such as *Ayurveda*, may be sought.

METHODOLOGY

The efficacy of *Ayurvedic* treatment protocols to manage PDR with complications was assessed in this case series. It conforms to methods described by the Case Report (CARE)

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guidelines to ensure transparency and efficiency in reporting.[5] Although institutional ethical clearance was not required, informed written consent was obtained from the patients before detailing their cases.

CASE 1

A 54-year-old male presented with the bilateral blurring of vision that was more OD (Right eye) than OS (left eye) since 2014 associated with floaters and occasional flashes of light OD for one year. He developed blurring of vision with vertical image distortion in 2014, for which he sought ophthalmic consultation. He underwent 4 rounds of injection of Avastin (Accentrix and Ozurdex) in both eyes but got minimal relief. He has had diabetes, hypertension, and hyperlipidemia for 18 years, for which he is under medication. His treatment history was remarkable for cataract surgery in 2009 and 2013. His immediate family members do not present with similar complaints. Both unaided and aided distant visual acuity (DVA) were LogMAR 1.778 OD and LogMAR 1 OS, and near visual acuity (NVA) was N36 OD and N18 OS. A -0.25 diopter (D) spherical lens with a -1.00D cylinder and 80° axis corrected the DVA OD to LogMAR 1.1, and a +0.75D spherical lens with -1.00 cylinder and 90° axis corrected the DVA OS to LogMAR 0.80. NVA was corrected to N18 by a +2.25D lens. Rubeosis iridis was absent OU (both eyes), lens showed pseudophakia with posterior-segment intra-ocular lens (IOL) implantation OU, and both direct and consensual pupillary reactions were within normal limits OU. Other structures of the anterior segment were within normal limits OU. Posterior segment examination showed pale areas, oedema, and neovascularization OD, **(Figure 1a)** and hard exudates OS. **(Figure 1b)** OCT scanning showed a dome-shaped elevation with a hypo-reflective area within the dome OD **(Figure 1c)** and small cyst-like lesions at the macula OS. **(Figure 1d)** He was admitted for a 16-day course of *Ayurvedic* inpatient treatment.

Visual acuity at discharge showed maintenance of unaided and aided DVA, NVA, and refraction. The same readings were reported at a subsequent follow-up three months post-discharge. Another follow-up two months later showed improvement in unaided DVA to LogMAR 1.477 OD, while DVA OS was maintained at LogMAR 1. A -0.25D spherical lens with a -1.00 cylinder and 90° axis corrected the DVA to LogMAR 1.079 OD. Posterior segment examination at discharge showed resolution of pale areas, oedema, and neovascularization OD **(Figure 1e)**, and hard exudates OS **(Figure 1f)**. OCT scanning showed complete absorption of macular oedema OD **(Figure 1g)** and reduction of cyst-like lesions OS. **(Figure 1h)**

CASE 2

A 47-year-old female presented with a 5-month history of dimness and distortion of vision OU. 5 months ago, she experienced floaters and blurring of vision. She consulted an ophthalmologist, who prescribed intravitreal injections. She underwent one course of injection, which caused infection in both eyes. This was controlled with medicines prescribed from another hospital. She has had diabetes for 16 years and hypertension for 10 years, for which she is under medication. Her immediate family members do not present with similar complaints. Unaided DVA was LogMAR 1 OD and LogMAR 0.78 OS, and NVA was N24 OU. Rubeosis iridis was absent OU, lens examination showed cortical cataract OU, both direct and consensual pupillary reflexes were within normal limits OU, and other structures of the anterior segment were within normal limits OU. Posterior segment examination showed vitreous haemorrhage OD **(Figure 2a)**, cotton-wool spots OS **(Figure 2b)**, and retinal haemorrhages and neovascularization OU. **(Figures 2a and 2b)** OCT scanning showed cystoid macular oedema and vitreomacular traction OD **(Figure 2c)**, and macular oedema OS. **(Figure 2d)** She was advised to undergo an inpatient *Ayurvedic* treatment protocol for 16 days.

Unaided DVA OU was maintained at discharge, and improved to LogMAR 0.60 OD and LogMAR 0.47 OS at a subsequent follow-up. NVA OU was maintained at discharge and improved to N18 OU at the follow-up consultation. Posterior segment examination showed resolution of vitreous haemorrhages and macular oedema OD, **(Figure 2e)** resolution of cotton wool spots OS, **(Figure 2f)** and resolution of retinal haemorrhages and neovascularization OU. **(Figures 2e and 2f)** OCT scanning showed resolution of vitreomacular traction OD, and cystoid macular oedema OD, **(Figure 2g)** and resolution of macular oedema OS. **(Figure 2h)**

CASE 3

A 58-year-old male presented with a complaint of diminished distant vision OU, which was more OS, associated with floaters in his right visual field since 2018. He consulted an ophthalmologist, who prescribed pars plana vitrectomy, fluid-air exchange (FAX), endo-LASER, and silicone oil implantation, which was done in June 2018. He experienced mild clarity of vision after surgery, The same symptoms reappeared soon after, for which he consulted an ophthalmologist, who advised surgical management. The patient declined the same. He has had diabetes for 15 years. His immediate family members had diabetes but without ophthalmic issues. His personal and social histories, vital signs, and review of systems were within normal limits. Both unaided and aided DVA were LogMAR 1 OD and HM+ve OS, and NVA was N18 OU. A -0.75D cylindrical lens with an 80° axis correct-

ed his DVA OD to LogMAR 0.5. Rubeosis iridis was absent OU and lenticular changes OU were noted. Other structures of the anterior segment were normal OU. Both direct and consensual pupillary reflexes were within normal limits OU. Posterior segment examination showed grade 1 clinically significant macular oedema, vitreous haemorrhages, and tractional retinal detachment OD, **(Figure 3a)** and post-surgical retinal detachment and pale optic disc OS. **(Figure 3b)** OCT scanning showed tractional retinal detachment OS **(Figure 3c)** and macular oedema OU **(Figures 3c and 3d)** He was admitted for a 20-day course of *Ayurvedic* inpatient management.

VA was maintained at discharge. Improvement in unaided DVA to LogMAR 0.60 OD and LogMAR 1.778 OS, and aided DVA to LogMAR 0.3 OD and LogMAR 1.778 OS was observed at a subsequent follow-up; another follow-up showed improvement in unaided DVA to LogMAR 0.30 OD with the maintenance of the other values. Posterior segment examination at discharge showed a reduction in vitreous haemorrhage and some resolution of tractional retinal detachment OD **(Figure 3e)** and no improvement in the fundus OS. **(Figure 3f)** OCT scanning showed resolution of tractional retinal detachment OS **(Figure 3g)** and macular oedema OU. **(Figures 3g and 3h)**

Additional Information

The patients' treatment protocols were tailored based on the *Ashta Sthana Pariksha* (8 parameters for examination) and *Dasavidha Pariksha* (10 parameters of examination). **(Table 1)** Treatments were done with oral medicines **(Table 2)** and local therapies to both eyes and head. **(Table 3)**. Also, the patients were instructed to adhere to a strict diet regimen during treatment.

Panchakarma (five bio-cleansing procedures), generally a requirement for ophthalmic and systemic disorders, were not performed due to the severity of the condition and patient vulnerability.

Fasting blood glucose and post-prandial blood glucose were assessed before and after treatments for all patients. **(Table 4)** Discharge medicines and instructions to strictly adhere to a diabetic diet and maintain serum glucose were given to the patients.

A timeline of events for each case is provided in **Tables 5-7**.

All medicines, except Chimiumco Tablet, were manufactured at Sreedhareeyam Farmherbs India, Pvt. Ltd., the hospital's Good Manufacturing Practices (GMP)-certified medicine manufacturing unit. Chimiumco Tablet was manufactured at J&J Dechaine Laboratories, Pvt. Ltd, based in Hyderabad, Telangana State.

DISCUSSION

Diabetes mellitus, closely compared to *Prameha* or *Meha* in the *Ayurvedic* canon, denotes a set of clinical disorders with frequent abnormal micturition.[6] It is one of the eight dreadful diseases, *viz., Vatavyadhi* (neurological diseases), *Asmari* (renal calculus), *Kushta* (skin disorders including leprosy), *Meha* (metabolic disorders including diabetes), *Udara* (abdominal enlargement including ascites), *Bhagandara* (fistula-in-ano), *Arsas* (haemorrhoids), and *Grahani* (irritable bowel) as per *Ayurveda*.

Meha as a cause for *Netra Roga* (ophthalmic disease) was told by the *Netra Prakasika,* an ancient work on *Ayurvedic* ophthalmology.[7] The *Samprapti* (pathogenesis) of diabetic retinopathy revolved around *Srotobhishyanda* (pathological oozing from the *Srotas* or metabolic channels) and *Rakta-vaha Sroto Dushti* (the pathological activity of the blood-carrying channels). These were caused by increased *Pitta* due to the patients following diets and lifestyle detrimental to eye health.[7] *Pitta* amalgamated with *Kapha* to pathologically increase blood and cause the characteristic fundus findings. Besides, *Kapha* obstructed the path of *Vata* to deliver essential nutrients to the eye. *Vata* underwent *Avarana* (occlusion) with *Rakta* due to hypoxia, resulting in increased blood viscosity, decreased activation of leucocytes, aggregation of red blood cells, and decreased blood flow. A cascade of events leading to retinal ischemia ensued, which resulted in neovascularization, the hallmark feature of PDR. The defective vision was due to the *Doshas* settling into the *Drishti Patalas* (functional parts of vision), and causing symptoms ranging from indistinct vision to complete blindness. Macular oedema may have been due to settling of the *Doshas* at the macula and obstructing *Vyana Vata* (*Vata* responsible for circulation), causing swelling at the region.

The *Madhyama Rogamarga* (middle pathway of disease) constitutes sense organs including the eye. Neovascularization may be correlated with *Vimarga Gamana* (diversion of flow), in which nutrients are supplied elsewhere. *Sanga* or obstruction can be taken as oedema as there is restricted flow and excess-accumulation. *Sira Granthi* is the formation of scarring as a precursor to retinal detachment.

Common effects of the oral medicines included antioxidant, anti-diabetic, hypoglycemic, and hematopoietic. They were *Kapha-Pitta Samana* (pacified *Kapha* and *Pitta*), *Dipana-Pacana* (digestive and carminative), *Prameha Hara* (anti-diabetic), *Cakshushya* (beneficial for the eyes), *Sothahara* (anti-edematous), *Mutrala* (diuretic), *Rakta Prasadaka* (blood-purifying), and *Rasayana* (rejuvenation).

The *Netra Kriyakalpa* (local ophthalmic procedures) and treatments for the head were done as per the classical references.

Netra Dhara is a modification of classical *Seka* [8] in which the patient slowly blinks during irrigation. *Anjana* (collyrium) is done by moving the tip of a rod with medicine on it in the lower bulbar conjunctiva from the inner canthus to the outer canthus and back again.[9] However, it is done in the same manner as *Ascyotana* [10] in Sreedhareeyam due to hygienic constraints. *Siroveshtana* is a treatment procedure in which paste is kept on a Cora cloth and tied around the head while anchoring one end over the left ear and tying the other end over the top of the cranium.

The diet regulations were one of the key measures to control diabetes. Food items from all major food groups except meat, fish, and poultry were advised in the right quantity. Mild to moderate exercise was also advised. Wrong concepts of food intake such as intermittent fasting, avoiding rice, and adherence only to wheat was not advised.

Maintenance of serum glucose was to avoid a resurgence of symptoms and manifestation of potentially dreadful complications such as neovascular glaucoma.[11]

CONCLUSION

A challenge faced in managing these cases was the maintenance of vision. Although macular oedema and other complications substantially diminished, the vision was still slightly blurred. Positive ocular and systemic results in the patients were a direct result of the oral medicines, external treatments, and dietary and lifestyle restrictions. Overall satisfaction was reported by the patients during their treatments. A concerted effort by the four limbs of treatment as described by *Ayurveda*, *viz.,* physician, medicament, attendants, and patient, was key to the positive results. The results obtained in this series may be further validated using large-scale sample trials.

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Abbreviations

DR: diabetic retinopathy

NPDR: non-proliferative diabetic retinopathy

PDR: proliferative diabetic retinopathy

VTDR: vision-threatening diabetic retinopathy

VEGF: vascular endothelial growth factors

CAM: complementary and alternative medicine

DVA: distant visual acuity

NVA: near visual acuity

LogMAR: logarithm of the minimal angle of resolution

D: diopter

OD: oculus dexter

OS: oculus sinister

OU: oculus uterque

OCT: optical coherence tomography

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Table 1: *Ayurvedic* **Diagnostic Parameters of the 3 patients**

Parameter	Patient 1	Patient 2	Patient 3
	***Ashtasthana Pariksha* (8 methods of examination)**		
***Nadi* (pulse)**	*Kapha Pitta*	*Kapha Pitta*	*Kapha Vata*
***Mutra* (urine)**	*Prakrta*	*Prakrta*	*Prakrta*
***Mala* (excreta)**	*Prakrta*	*Prakrta*	*Prakrta*
***Jihva* (tongue)**	*Anupalipta*	*Anupalipta*	*Anupalipta*
***Sabda* (sound)**	*Prakrta*	*Prakrta*	*Prakrta*
***Sparsa* (touch)**	*Anushnasita*	*Anushnasita*	*Anushnasita*
***Drk* (sight)**	*Vaikrta*	*Vaikrta*	*Vaikrta*
***Akrti* (appearance)**	*Prakrta*	*Prakrta*	*Prakrta*
	***Dasavidha Pariksha* (10 methods of examination)**		
***Prakrti* (somatic constitution)**	*Kapha Pitta*	*Pitta Kapha*	*Kapha Vata*
***Vikrti* (status of disease)**	■ ***Dosha:*** *Kapha* ■ ***Dhatu:*** *Rasa, Rakta*	■ ***Dosha:*** *Kapha* ■ ***Dhatu:*** *Rasa, Rakta*	■ ***Dosha:*** *Kapha, Vata* ■ ***Dhatu:*** *Rasa, Rakta*
Sara **(essence of *Dhatus*)**	*Rakta*	*Mamsa*	*Rakta*
Samhanana **(compactness of body parts)**	*Pravara*	*Pravara*	*Madhyama*
Pramana **(measurement of body parts)**	*Madhyama*	*Madhyama*	*Madhyama*
***Sattva* (psyche)**	*Pravara*	*Madhyama*	*Mdhyama*
***Satmya* (habituation)**	*Pravara*	*Madhyama*	*Madhyama*
Ahara Sakti **(capacity of digestion)**	*Madhyama*	*Madhyama*	*Madhyama*
Vyayama Sakti **(capacity for exercise)**	*Madhyama*	*Madhyama*	*Madhyama*
***Vaya* (age)**	*Madhyama Vaya*	*Madhyama Vaya*	*Madhyama Vaya*

Table 2: Oral Medicines

Medicine	Dose	*Anupana* (post-prandial drink)	Case	Duration
***Kvatha* (Herbal Decoctions)**				
Samirapancakam Kvatha*	30mL	*Sukhoshna Jala*	1	16 days
	60mL		3	49 days
	15mL		3°	2 months
Drakshadi Kvatha	30mL	*Sukhoshna Jala*	1	16 days
Pancatikta Guggulu Kvatha	15mLmL	*Sukhoshna Jala*	1°	2 months
Pathya Shadangam Kvatha	15mL	*Sukhoshna Jala*	1°	2 months
Punarnavadi Kvatha	15mL	*Sukhoshna Jala*	2°	2 months
Ciribilvadi Kvatha	60mL	*Sukhoshna Jala*	3	
Tablets				
Candraprabha Vati	1 tablet twice a day after food	*SamirapancakamKvatha*	1	16 days
Vasa Sree*	1 tablet twice a day after food	*Sukhoshna Jala*	2°	2 months
			3°	

Table 2: *(Continued)*

Medicine	Dose	*Anupana* (post-prandial drink)	Case	Duration
Triphala Guggulu	1 tablet twice a day after food	*Pancatikta Guggulu Kvatha*	1°	2 months
Chimiumco Tablet^	1 tablet twice a day after food	*Sukhoshna Jala*	2°	2 months
Vasti Rasayana*	1 tablet twice a day after food	*Sukhoshna Jala*	1	16 days
			1°	2 months
Mandura Vataka	1 tablet twice a day after food	Buttermilk	2	13 days
			2°	2 months
DhatakyadiVati	1 tablet twice a day after food	*Sukhoshna Jala*	3°	2 months
***Haridra* Tablet**	1 tablet	*Sukhoshna Jala*	3°	2 months
***Tulasi*Tablet**	1 tablet	*Sukhoshna Jala*	3°	2 months
***Curna* (herbal powders)**				
Vara Curna	5g	*Sukhoshna Jala*	1	16 days
Pathya PunarnavadiCurna	5g	*Sukhoshna Jala*	1	16 days
CandansiradiCurna*	5g	*SamirapancakamKvatha*	3	14 days

Table 3: External Therapies

Treatment	Medicine	Case	Duration	Procedure of Therapy
***Netra Kriyakalpa* (local ophthalmic therapies)**				
Netra Dhara	*MrdvikadiKvatha*	1	16 days	■ The patient lay supine and was asked to blink as the decoction was poured in a thin stream from a height of 2 inches over the eyes.
	Milk	3	11 days	
Ascyotana	Drops of *Veroniacinerea*Linn.	1	6 days	■ The patient lay supine and one drop of the medicine was instilled into the sub-conjunctival sac. The patient was asked to slowly rotate the eyes after installation with the eyes closed.
		3	20 days	
	Drops of *Veroniacinerea*Linn., *Ocimum sanctum* Linn.	2	11days	
	*Netramrtam** (°)	1	Twice a day	
	Drops prepared from *Leucas aspera* Linn.	1°	2 months	
Anjana	Eye Plus*	1	16 days	
	*Netramrtam**	3	11 days	
Bidalaka	*MukkadiPurampada*and *Karutta Gutika*	1	14 days	■ One tablet of both medicines was grounded and mixed with water to obtain a paste. This paste was applied over the eyelids while obviating the eyelashes.
		3	11 days	
Pindi	*MukkadiPurampada, LakshadiChurna,* Milk	2	7 days	■ A semisolid paste was prepared by mixing the ingredients with water. This was tied in two cotton pads and placed over the closed eyes.
	MukkadiPurampada and *Mimosa pudica*-Linn.		10 days	
Treatments for the Head				
Sirolepa	*Vasa LakshadiChurna* and *Vasa GuducyadiK-vatha*	2	14 days	■ A paste prepared using 30g of herbal powder and 60mL of decoction was kept over the vertex of the head.

Table 3: *(Continued)*

Treatment	Medicine	Case	Duration	Procedure of Therapy
Siroveshtana	*Vasa LakshadiChurna* and *Vasa GuducyadiKvatha*	1 3	16 days 9 days	■ A semisolid paste prepared by mixing 45g of all ingredients with the desired liquid medium was smeared over a Cora cloth and applied to the head (area with the paste facing inwards) in the following manner: ■ One end of the cloth was anchored above the right ear. ■ The cloth was wrapped over the forehead above the eyebrows and towards the left ear. ■ From the left ear, the cloth was wrapped around the back of the head and brought upwards around the head while the vertex is avoided. ■ The other end of the cloth was applied to the top of the head. ■ Any leftover paste was applied to the uncovered portion of the head.
	Adathoda vasica Nees., *Laccifer lacca* Kerr., *Terminalia chebula* Retz., and *Kaisora Guggulu*	2	14 days	
Takradhara	*Vasa GuducyadiKvatha*and *Takra*	3	10 days	■ 2L of milk was boiled with 4L of water. The herbal decoction was added to this and boiled until 2L of milk remained. This was left to ferment overnight, after which it was churned and buttermilk obtained. ■ The patient lay supine on the treatment table. A thin cloth band was tied around the forehead. A pot with an 8mm hole in the centre of the bottom was suspended above the patient's head with ropes and a cotton wick was placed in the hole. The buttermilk was poured into the pot and was allowed to drain through the hole onto the patient's head. The pot was moved from side to side.
Lepa	*Cynodon dactylon* D. Don., and *Veroniacinerea*Linn.	3	9 days	■ A paste prepared using 30g of herbal powder and 60mL of decoction was applied over the forehead in a uniform consistency.
	Powder of *Laccifer lacca* Kerr.	1°	1 hour every day	
	Powder of *Glycyrrhyza glabra* Linn.	1°		
	Powder of *Terminalia chebula* Retz.	1°		
	Oil of *Ricinus communis* Linn.			
	MukkadiPurampada(°)	2		

°*Prescribed at discharge*
**Patented medicine of Sreedhareeyam Ayurvedic Eye Hospital and Research Center*
^*Patented medicine of J&J Dechane Laboratories*

Table 4: Laboratory Investigations for the 3 patients

Parameter	Case 1		Case 2		Case 3	
	Baseline	Endpoint	Baseline	Endpoint	Baseline	Endpoint
Fasting Blood Glucose	132 mg/dL	63 mg/dL	186 mg/dL	160 mg/dL	159 mg/dL	116 mg/dL
Post-Prandial Blood Glucose	210 mg/dL	108 mg/dL	245 mg/dL	155 mg/dL	262 mg/dL	159 mg/dL

Table 5: Timeline of Events for Case 1

Date	Events
2014	• The patient develops bilateral blurring of vision, which is more OD than OS. • He initially develops blurring of vision with vertical image distortion. • Consults an ophthalmologist, who prescribes anti-VEGF injections
2014-2017	• The patient undergoes four rounds of injection but gets minimal relief.
16/12/2017	• Patient consults Sreedhareeyam Hospital and is advised for inpatient management.

	• **DVA (unaided and aided):** LogMAR 1.778 OD, LogMAR 1 OS
	• **NVA:** N36 OD, N18 OS
	• **Refraction:**
	  • LogMAR 1.1 OD with a lens of -0.25 diopter with a -1.00D cylinder and 80° axis
	  • LogMAR 0.80 OS with a lens of +0.75 diopter with a -1.00D cylinder and 90° axis
	• **Anterior Segment:** Within normal limits, without rubeosis iridis OU
	• **Lens:** Pseudophakia (posterior-segment IOL) OU
	• **Pupillary examination:** Within normal limits OU
	• **Posterior Segment:** Pale areas, oedema, and neovascularization OD, hard exudates OS
	• **OCT:** macular oedema OD, cyst-like lesions OS
	• **Laboratory Investigations:** FBS:132mg/dL; PPBS: 210mg/dL

	• ***Samirapancakam Kvatha***, **Drakshadi Kvatha, Candraprabha Vati,*** and ***Vasti Rasayana**** are started. • ***Netra Dhara, Anjana,*** and ***Siroveshtana*** are started.
17/122017	• The patient is given a dietary consultation.
18/122017	• ***Purampada*** is started.
26/122017	• ***Ascyotana*** is started.
31/12/2017	• All medicines and treatments are stopped

	• **DVA (unaided and aided):** LogMAR 1.778 OD, LogMAR 1 OS
	• **NVA:** N36 OD, N18 OS
	• **Refraction:**
	  • LogMAR 1.1 OD with a lens of -0.25D with a -1.00D cylinder and 80° axis
	  • LogMAR 0.80 OS with a lens of +0.75D with a -1.00D cylinder and 90° axis
	• **Posterior Segment:** Resolution of pale areas, oedema, and neovascularization OD, resolution of hard exudates OS.
	• **OCT:** reduction of macular oedema OD and cystic lesions OS.
	• **Laboratory Investigations:** FBS:63mg/dL; PPBS: 108mg/dL

23/03/2018	• Patient reports for a follow-up consultation.

	• **DVA (unaided and aided):** LogMAR 1.778 OD, LogMAR 1 OS
	• **NVA:** N36 OD, N18 OS
	• **Refraction:**
	  • LogMAR 1.1 OD with a lens of -0.25D with a -1.00D cylinder and 80° axis
	  • LogMAR 0.80 OS with a lens of +0.75D with a -1.00D cylinder and 90° axis

26/05/2018	• Patient reports for a follow-up consultation.

	• **DVA (unaided and aided):** LogMAR 1.477 OD, LogMAR 1 OS
	• **NVA:** N36 OD, N18 OS
	• **Refraction:**
	  • LogMAR 1.O79D with a lens of -0.25D with a -1.00D cylinder and 90° axis
	  • LogMAR 0.80 OS with a lens of +0.75D, a -1.00D cylinder and 90° axis

Table 6: Timeline of Events for Case 2

Date	Events
09/2018	• Patient develops dimness and distorted vision OU • Consults an ophthalmologist, who prescribes anti-VEGF injections.
09/2018 - 02/2019	• Patient undergoes one round of anti-VEGF injection, which results in infection to both eyes. • The infection is controlled with medicines from another hospital.
23/02/2019	• Patient consults Sreedhareeyam Hospital and is advised for inpatient management.
	• **DVA (unaided):** LogMAR 1 OD, LogMAR 0.78 OS • **NVA:** N24OU • **Anterior Segment:** Within normal limits, without rubeosis iridis OU • **Lens:** Cortical cataract OU • **Pupillary examination:** Within normal limits OU • **Posterior Segment:** Vitreous hemorrhage OD, cotton-wool spots OS, retinal hemorrhages and neovascularization OU • **OCT:** cyst-like lesions and vitreo-macular traction OD, macular edema OS • **Laboratory Investigations:** FBS: 186mg.dL; PPBS: 245mg/dL
	• ***Mandura Vataka*** (herbo-mineral preparation) with **buttermilk** is started. • ***Pindi*** and ***Sirolepa*** are started.
26/022019	• ***Ascyotana*** is started.
27/02/2020	• ***Siroveshtana*** is started.
01/03/2020	• ***Pindi*** is stopped.
08/03/2020	• All medicines and treatments are stopped
	• **DVA (unaided):** LogMAR 1.0 OD, LogMAR 0.78 OS • **NVA:** N24 OU • **Posterior Segment:** Resolution of vitreous haemorrhage OD, cotton-wool spots OS, and retinal haemorrhage and neovascularization OU. • **OCT: the** resolution of cyst-like lesions and vitreomacular traction OD, and macular oedema OS. • **Laboratory Investigations:** FBS: 160mg/dL; PPBS: 155mg/dL
10/04/2020	• Patient reports for a follow-up consultation.
	• **DVA (unaided):** LogMAR 0.60 OD, LogMAR 0.47 OS • **NVA:** N18 OU

Table 7: Timeline of Events for Case 3

Date	Events
2018	• The patient develops diminished distant vision OU, which is more OS, associated with floaters in his right visual field. • Consults an ophthalmologist
06/2018	• Undergoes pars plana vitrectomy, fluid-air exchange (FAX), endo-LASER, and silicone oil implantation. • Experiences mild clarity of vision
06/2018 - 10/2018	• Symptoms reappear. • Patient consults an ophthalmologist, who prescribes surgery, which the patient declines
09/10/2018 11/10/2018 17/10/2018	• Patient consults Sreedhareeyam Hospital and is advised for inpatient management.
	• **DVA (unaided and aided):** LogMAR 1.00 OD, HM+ve OS • **NVA:** N18 OU • **Refraction:** LogMAR 0.5 OD with a -0.5D cylindrical lens with 80° axis • **Anterior Segment:** Normal findings OU, rubeosis iridis absent • **Lens:** lenticular changes OU • **Pupillary Examination:** Within normal limits OU • **Posterior Segment:** Grade 1 clinically significant macular oedema, vitreous haemorrhage, and tractional retinal detachment OD and post-surgical retinal detachment and pale optic disc OS. • **OCT:** Macular oedema OU, tractional retinal detachment OS • **Laboratory Investigations:** FBS: 159mg/dL, PPBS: 262mg.dL

Table 7: ***(Continued)***

	• ***Samirapancakam Kvatha*, Ciribilvadi Kvatha,*** and ***Candanosiradi Curna*** are started. • ***Netra Dhara, Pindi, Ascyotana,*** and ***Lepa*** are started. • ***Anjana*** and ***Purampada*** are started. • ***Siroveshtana*** is stopped.
18/10/2018	• ***Takradhara*** is started.
19/10/2018	• ***Netra Dhara*** is stopped.
27/10/2018	• ***Takradhara*** is stopped.
29/10/2018	• All medicines and treatments are stopped. • **DVA (unaided and aided):** LogMAR 1.00 OD, HM+ve OS • **NVA:** N18 OU • **Refraction:** LogMAR 0.5 OD with a -0.5D cylindrical lens with 80° axis • **Posterior Segment:** Reduction in vitreous haemorrhage and some resolution in tractional retinal detachment OD, no improvement OS • **OCT:** Resolution in macular oedema OU and tractional retinal detachment OS • **Laboratory Investigations:** FBS: 116mg/dL, PPBS: 159mg.dL
10/02/2019	• Patient reports for a follow-up consultation. • **Unaided DVA:** LogMAR 0.60 OD and LogMAR 1.778 OS • **Aided DVA:** LogMAR 0.30 OD and LogMAR 1.778 OS.
04/07/2019	• Patient reports for a follow-up consultation. • **Unaided DVA:** LogMAR 0.30 OD and LogMAR 1.778 OS • **Aided DVA:** LogMAR 0.30 OD and LogMAR 1.778 OS.

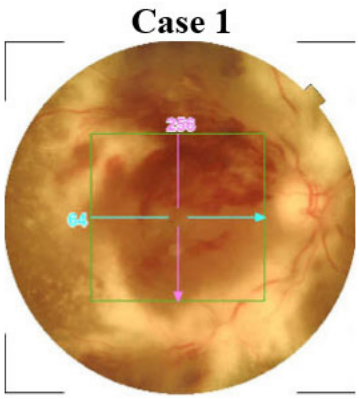

Figure 1a: Fundus examination OD at Admission.

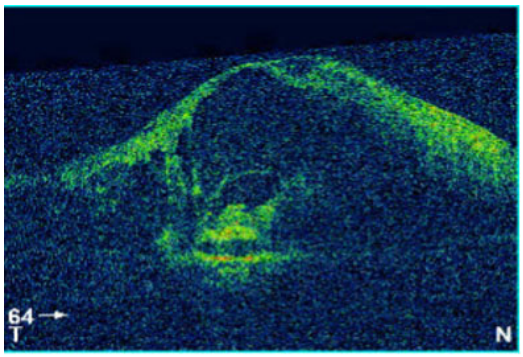

Figure 1c: OCT scanning OD at Admission.

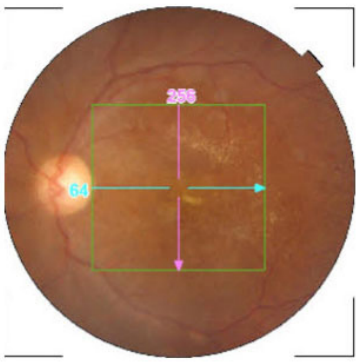

Figure 1b: Fundus examination OS at Admission.

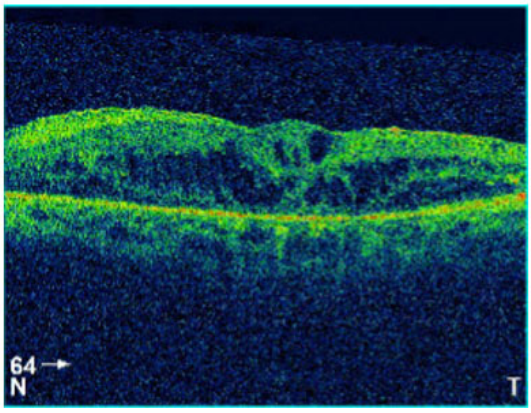

Figure 1d: OCT scanning OS at Admission.

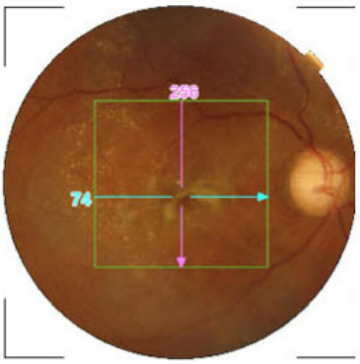

Figure 1e: Fundus examination OD at Discharge.

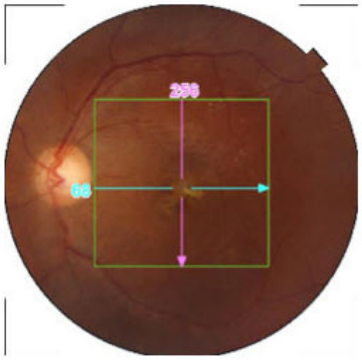

Figure 1f: Fundus examination OS at Discharge.

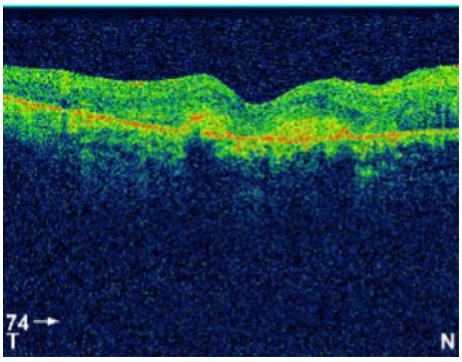

Figure 1g: OCT scanning OD at Discharge.

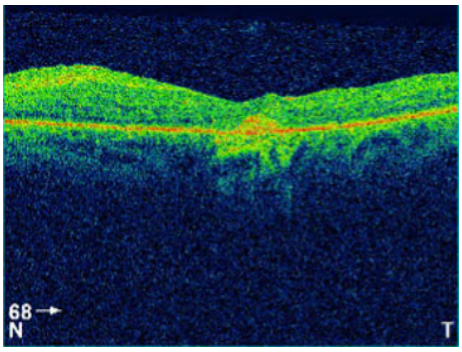

Figure 1h: OCT scanning OS at Discharge.

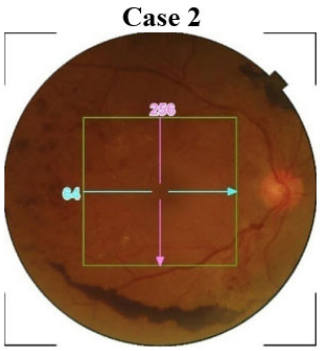

Figure 2a: Fundus examination OD at Admission.

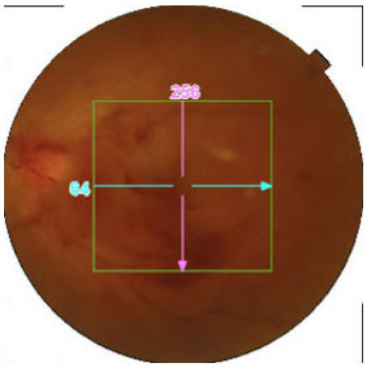

Figure 2b: Fundus examination OS at Admission.

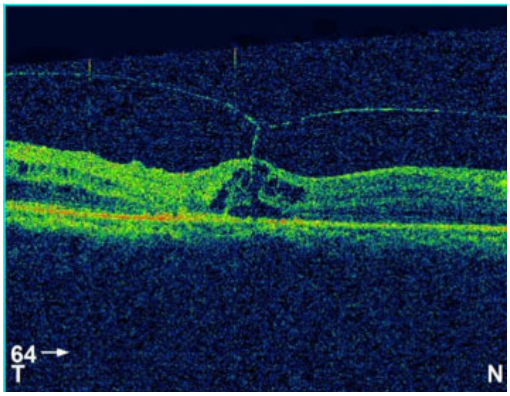

Figure 2c: OCT scanning OD at Admission.

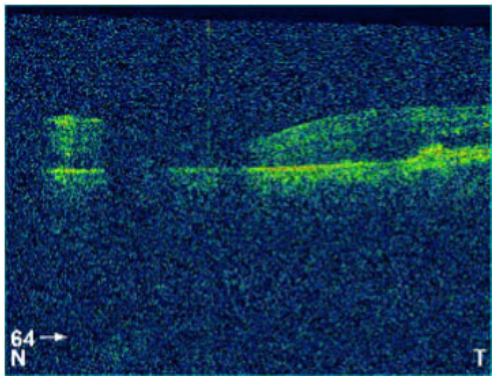

Figure 2d: OCT scanning OS at Admission.

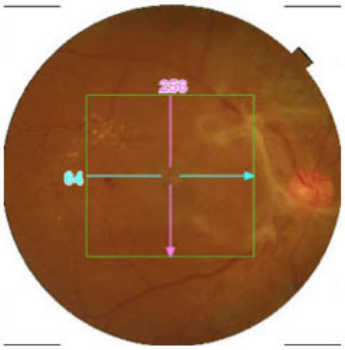

Figure 2e: Fundus examination OD at Discharge.

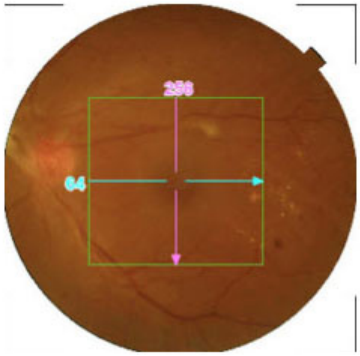

Figure 2f: Fundus examination OS at Discharge.

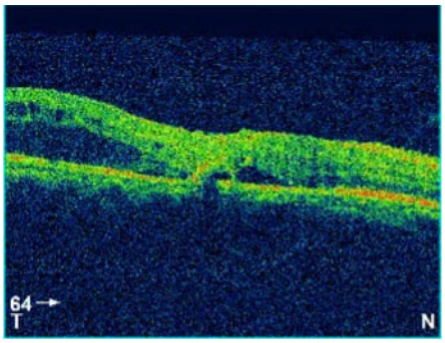

Figure 2g: OCT scanning OD at Discharge.

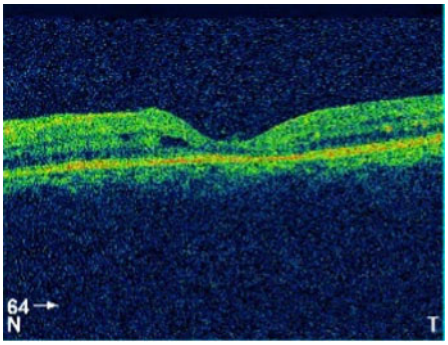

Figure 2h: OCT scanning OS at Discharge.

Case 3

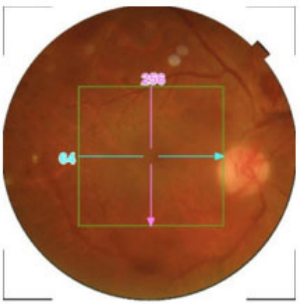

Figure 3a: Fundus examination OD at Admission.

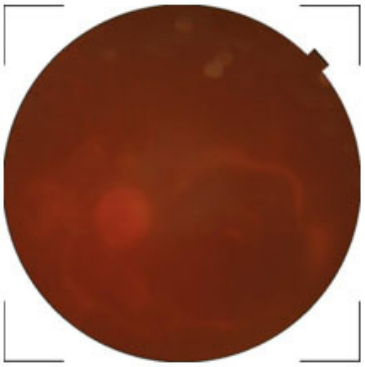

Figure 3b: Fundus examination OS at Admission.

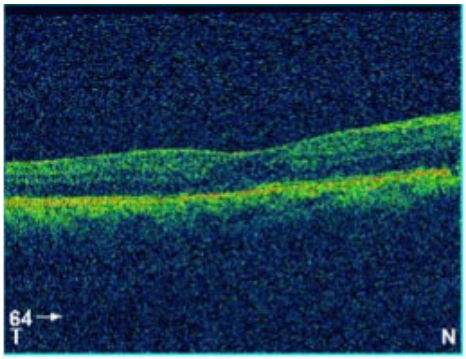

Figure 3c: OCT scan OD at Admission.

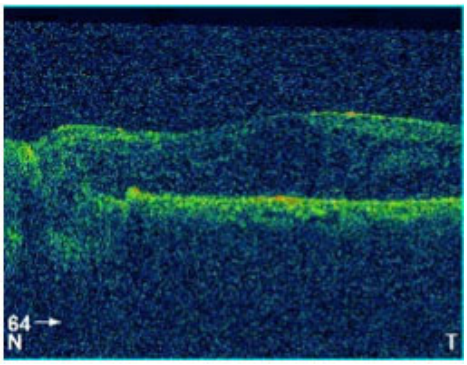

Figure 3d: OCT scan OS at Admission.

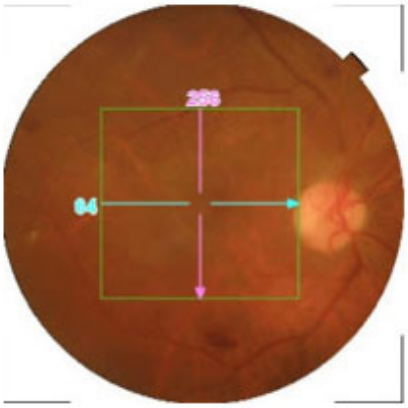

Figure 3e: Fundus examination OD at Discharge.

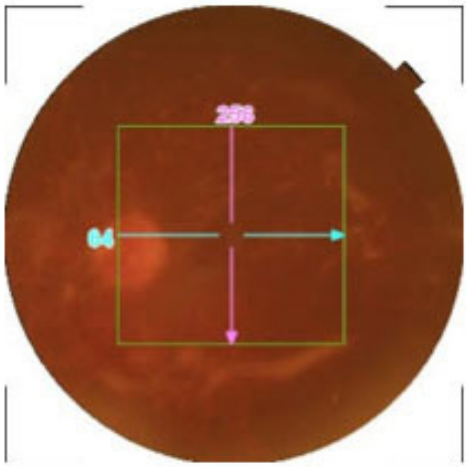

Figure 3f: Fundus examination OS at Discharge.

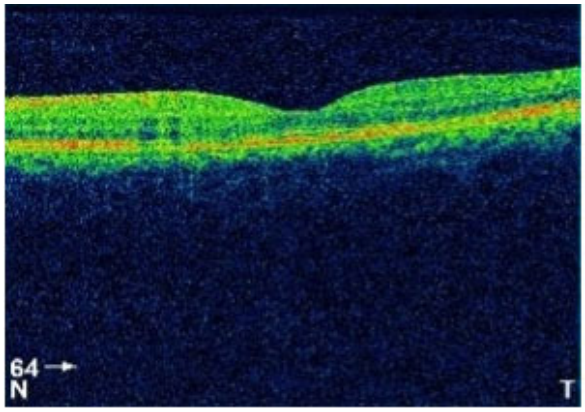

Figure 3g: OCT scan OD at Discharge.

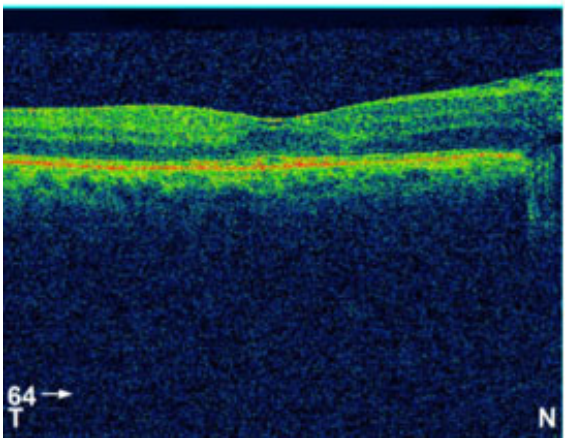

Figure 3h: OCT scan OS at Discharge.