



## Review Article

### DIABETIC RETINOPATHY AND ITS INTERPRETATIONS THROUGH AYURVED

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#### ABSTRACT

*Chakshyu* is the *Pradhana-anga* that is affected in Diabetic retinopathy. So the *Netra Rakshana* is highly essential for the human being in Diabetic retinopathy. Now-a-Days Diabetic retinopathy is a major vision threatening factor. The prevalence rates are; Diabetic retinopathy (34.6%), Proliferative Diabetic retinopathy (7%), diabetic macular oedema (6.8%) and Vision threatening Diabetic retinopathy (10.2%). To treat the disease we need to know the level of impairment, the signs and its etiopathology. In Ayurved it is very important to know the *Samprapti* before treating the disease. Now-a-days *Pratyaksha gyana* plays a vital role to trace out the disease. Complain of the patient, sign and symptom of the disease along with the pathogenesis is necessary to diagnose and to treat the disease. The features occurs in the fundus in Diabetic retinopathy cannot visualize by *Pratyaksha*, explained in classical literatures. Many ophthalmic investigations, procedures have been developed so far like fundoscopy, OCT, B'scan, fluorescent test etc. to detect the pathology occurred in the fundus of Diabetic retinopathy eyes. So it is very important for all *Shalaki* is to correlate the disease, to derive a conclusion according to the Ayurvedic *Samprapti/* pathogenesis and terminology described in classical literatures. By analyzing the *Samprapti* of the disease we can conclude that, the pathology occurred in fundus are most probably due to the *Dhatu-kshaya janya*, *Urdhwaga-raktapittaja*, *Mandagni janya* and *Avarana janya*. Diabetic retinopathy can be correlated with *Pramehaja Timira* and its treatment is the treatment of *Prameha* explained in classics having *Chakshushya* property.

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#### INTRODUCTION

To understand a disease, we have to know its pathology and pathological changes that is occurring inside the body. By comparing the changes with the normal structures and functions with the abnormal, we can easily diagnose a disease. According to modern Ophthalmology microvascular changes occurs in fundus of eye in Diabetic Retinopathy. Those changes can't be perceived without the help of modern technology and procedures. *Pratyaksha* is the most important tool to diagnose a disease. Till the invention of modern logistics and procedures it was very difficult to do *Pratyaksha*. By making *Anumana* from the symptoms which are told by the patients, it was

very difficult to predict or diagnose a disease. Now by the development of procedures like Fundoscopy, OCT, B'scan, FFA tests, we can easily diagnose the Diabetic retinopathy. The various signs and symptoms of Diabetic retinopathy can be correlated with the *Lakshana* of *Dhatu-kshaya*, *Urdhwaga-Raktapitta*, *Avarana (Pranavritta-Vyana)* etc. The symptoms of Diabetic retinopathy may be similar to the *Kacha*, *Timira*, *Linganasha*, *Dhumadarshi* etc. So it is very essential to co-relate the etio-pathology and to interpret them with the terms of Ayurved. Now-a-days most of the Ayurved physicians are diagnosing the disease using modern technology and procedures. And by correlating them with

*Ayurvedic Samprapti*, it is easier for us to treat them with Ayurvedic principle and therapeutics.

### Description

Diabetic retinopathy is a chronic progressive sight-threatening disease of retinal microvasculature which is associated with prolonged hyperglycemia and other conditions linked to Diabetes such as hypertension.

### Pathogenesis<sup>[1]</sup>

In Diabetic retinopathy the retinal precapillary arterioles, capillaries and venules are affected. Hyperglycemia produces damage to the cell of retina, endothelial cells, loss of capillary pericytes and thickening of capillary basement membrane causes capillary damage. The Microangiopathy affects the breakdown of Blood-Retinal-Barrier leading to retinal edema, hemorrhages, leakage of lipids i.e., hard exudates, micro-aneurysms, hemorrhages, ischaemia and IRMA.

### Classification of Diabetic retinopathy<sup>[1]</sup>

The Diabetic Retinopathy can be classified into

#### a. Non-proliferative Diabetic retinopathy

- i. Mild NP Diabetic retinopathy
- ii. Moderate NP Diabetic retinopathy
- iii. Severe NP Diabetic retinopathy

#### b. Proliferative Diabetic retinopathy

#### c. Diabetic Maculopathy

#### d. Advanced diabetic eye disease (ADED)

During the examination of fundus in Diabetic retinopathy, following clinical features are found as sign and symptom.

### Symptoms of Diabetic retinopathy

- Blurred or distorted vision or difficulty reading
- Floaters
- Partial or total loss of vision
- A shadow or veil across patient's visual field
- Eye pain

### Sign of NP diabetic retinopathy<sup>[2]</sup>

- A. Micro aneurysm
- B. Retinal hemorrhage
  - i. "Dot or Blot" Spot
  - ii. "Flame or Splinter shape" hemorrhage
- C. Hard exudate
- D. Cotton wool spot
- E. Venous beading
- F. Intra-retinal microvascular abnormalities (IRMA)

### Sign of proliferative Diabetic retinopathy<sup>[2]</sup>

- Neovascularization
  - NVD (Neovascularization of Disc)
  - NVE (Neovascularization of Elsewhere)
- Vitreous changes.

### Final Stage of Uncontrolled PDR

- Glaucoma (Neovascularization).
- Blindness from Persistent Vitreous Hemorrhage.
- Tractional Retinal Detachment and Opaque Membrane Formation.

### Sign of Maculopathy<sup>[1]</sup>

- Macular ischemia
- Macular edema
- Increased retinal vascular permeability.

### Management of Diabetic retinopathy<sup>[1]</sup>

- Prevention of Diabetic retinopathy
- Medical treatment
  - Control of systemic risk factors.
  - Providing pharmacological modulators like
    - ✓ Protein Kinase C – PKC
    - ✓ Vascular Endothelial Growth Factors - VEGF
    - ✓ Antioxidant like Vitamin E
- Intravitreal anti-VEGF drugs like
  - Ranibizumab (0.5 mg)
  - Bevacizumab (1.25 mg)
- Intravitreal Steroids.
  - Fluocinolone Acetonide Intravitreal Implant
  - Intravitreal Injection of Triamcinolone
- Laser therapy
  - Macular Photocoagulation
    - ✓ Focal
    - ✓ Grid
  - Panretinal Photocoagulation (PRP)
- Vitreoretinal Surgery

### Prevention

- Proper Screening of Diabetic retinopathy - History taking, Fundoscopy, OCT, FFA etc.
- Controlling blood sugar i.e., HbA1c must below 7.
- Controlling blood pressure i.e. systolic BP must below 130 mmHg.
- Controlling lipid profile i.e., TG and LDL.
- We have to correct the Anaemia.
- We should control Diabetic Nephropathy
- Pregnancy makes Diabetic retinopathy worsen. So we need to be careful during Pregnancy.

## Ayurvedic Co-Relation of Diabetic retinopathy

Diabetic retinopathy is not mentioned in our classics as separate disease but the symptoms which are told in *Timira* mainly in *Prathama* and *Dwitiya Patala Gata Timira* as *Avyakta Darshana* and *Mashka* in front of the eyes which can be taken as blurriness of vision and floaters probably caused due to hemorrhages in the retina. And as per mentioned by Pujiyapada Muni in his work "*Netra Prakashika*" explains *Timira* as the *Upadrava* of *Madhumeha*.<sup>[3]</sup>

Ayurved is basing on the principle of *Dosha* and *Dhatu*. While treating patients, Ayurved physicians always consider the *Doshik* and *Dhatu* imbalance. The *Samprapti Vighatana* helps in planning the treatment. In Diabetic retinopathy there are structural and functional abnormality of *Sira* and *Dhamani* are seen. Those features of vascular abnormality can be correlate with *Urdwaga-Raktapitta* (*Netragata rakta srava/ Retinal Hemorrhage*), *Sira* and *Dhamani Saithilya* (seen in *Rakta* and *Mamsa Kshaya* respectively) i.e. *Dhatu Kshaya Janya*. According to *Astanga Hridaya* "*Madhumeha* arises by two ways; 1. Due to *Dhatu Kshaya* causing aggravation of *Vata Dosha* and 2. Obstruction of the path of *Vata* by *Doshas* covering it"<sup>[4]</sup> i.e., the *Avarana janya*. In other way it is told that all the disease are originated due to *Mandagni*.<sup>[16]</sup> So the *Samprapti* (Ayurvedic etiology) can be explained under the following headings.

1. *Dhatu Kshaya Janya*
2. *Avarana Janya*
3. *Raktapitta Janya*
4. *Mandagni janya*

### 1. *Dhatu kshaya*

*Oja* is the essence of all the *Dhatus*.<sup>[5]</sup> The *Oja Dhatu* diminishes in *Madhumeha*,<sup>[6]</sup> which is the cause of diminish/ *Kshaya* of all remaining *Dhatus*. Hence there will be *Kshaya* of *Rakta* and *Mamsa Dhatu* too. *Sira Saithilya* is the *Lakshana* of *Rakta Dhatu Kshaya*.<sup>[7,8]</sup> *Dhamani Saithilya* is the *Lakshana* of *Mamsa Dhatu Kshaya*.<sup>[9]</sup> *Sira* and *Dhamani Saithilya* indicates the dysfunction of the venules and arterioles. Dysfunction of those vessels can be expressed in terms of occlusion i.e., Central Retinal Artery Occlusion (CRAO), Branch Retinal Vein Occlusion (BRVO), Central Retinal Vein Occlusion (CRVO) Ischemia, leakage etc. In Diabetic retinopathy the sign are Micro Aneurysm, Retinal Hemorrhage, Venous Beading, Intra-Retinal Microvascular Abnormalities (IRMA) and Retinal Edema, which are nothing but the dysfunction of venules and arterioles. So the above clinical

features occurring in Diabetic Retinopathy are interpreted as *Dhatu Kshaya*.

### 2. *Avarana janya*

In *Raktavrit Vata* there is reddish patches found over body<sup>[10]</sup> those reddish patches may be correlated with the pre-capillary arteriole bleed and the splinter hemorrhage occurring in fundus of Diabetic retinopathy. In *Pranavritta Vyana Vayu* there is *Sunyata*, it means the *Indriya* cannot perceive their *Visaya* i.e., *Indriya Sunyata/* loss of vision in Diabetic retinopathy. The eye cannot perceive the subjects and it is to be treated like *Urdhwajatrugata Rogas*.<sup>[11]</sup> *Prana Vayu* controls the function of all other *Vayus*. So it also responsible for the visual perception. *Vyana Vayu* meant for *Gati*,<sup>[12]</sup> *Rasa Vikshepana*<sup>[13]</sup> and neural conduction. The circulation and visual conduction can be considered as the function of *Vyana Vayu*. So when the *Gati* of *Vyana Vayu* is obstructed by *Prana vayu*, the circulatory function and the neural conduction can also be hampered. There may be ischemia, occlusion, leaking and bleeding of the fundal vessels of the retina. The abnormality in *Rasavikshepana* can be considered as the hard exudates (the lipid) in the Retina. Due to the excessive deposit in macular region there will be macular edema. Sometimes the Cessation of *Gati* leads to *Khavaigunya*.<sup>[14,15]</sup> *Kha'* means empty space which can be correlated with ischemia that leads to Neovascularization. By combining the *Vikruti* in *Pranavritta Vyana Vayu* there will be defect in vision caused due to the neovascularisation's, exudates, ischemia, occlusion and leakage.

So the above clinical signs indicating *Avarana* causing Diabetic Retinopathy.

### 3. *Raktapitta janya*

*Rakta-Pitta* is the disease in which there will be bleeding from different part of body. Based on the site of bleeding it is categorized in to *Urdhwaga*, *Adhoga* and *Tirjag Rakta-Pitta*. In *Urdhaga Raktapitta* there will be bleeding from the *Jatrurdhwa* structures like *Mukha*, *Nasa* and *Chakshyu*. Due to intake of *Achakshyushya Dravya*, the neutral *Pitta* and *Rakta* gets vitiated. Then the *Dushita Pitta* and *Rakta* get confined to the choroidal layer of eye and causes Intra-Retinal Microvascular Abnormalities (IRMA). This includes Micro-aneurysm, Retinal hemorrhage, ("Dot or Blot" Spot, "Flame or Splinter shape" hemorrhage), Hard exudate, Cotton wool Spot and Venous, bleeding. The above clinical features i.e., Retinal hemorrhage and Intra-Retinal Microvascular Abnormalities, IRMA which is the prime sign of Diabetic

retinopathy. This suggests that Diabetic retinopathy as the *Urdhwaga Rakta-pitta Janya*.

#### 4. Mandagni

*Roga sarbapi mandagnou*.<sup>[16]</sup>: All the disease of human being are originated due to *Mandagni*. *Mandagni* produces *Ama*, the waste product. *Dhatu* produces the successive *Dhatu* by their respective *Dhatwagni*. And if there is *Mandagni*, the respective *Sara Bhaga* (the 7 *Dhatu*) and *Kitta Bhaga* (the 3 *Dosha*)<sup>[17]</sup> of *Dhatu* cannot be formed properly and there will be deposition of *Ama*. This results in the improper production of the successive *Dhatu* and imbalance of *Dosha*. The *Alochaka Pitta*, which seats on the eye gets vitiated and causes the disturbance in perception of images which may be co-related with the blurriness or floaters i.e., *Timira*. And if this disturbance in perception associated with *Prameha* then it can be told as *Pramehaja-Timira*.

By combining all the clinical features of Diabetic retinopathy we can conclude that the pathology occurred in Retina of Diabetic retinopathy i.e., the structural and functional abnormality of micro vessels, are caused by the disturbance of *Dosha* i.e., *Vata (Prana, Vyana Vayu)*, *Pitta, Rakta (Urdhwaga Raktapitta)*, *Dhatu (Rakta, Mamsa) Kshaya, Oja* and *Mandagni*.

#### Treatment of Diabetic retinopathy according to Ayurved

Though the *Madhumeha Janya Timira* and its treatment is not explained directly in our classical literature, still we can treat the disease according to its *Samprapti Vighatana* as explained above. Drugs with the property of *Chakshushya*, used in *Prameha/ Madhumeha* will be chosen to treat the *Prameha Janya Timira*.

The treatment Protocol will be

1. *Nidana-Paribarjana (Nidanakara Ahara/ Vihara of Prameha and Timira)*
2. *Sodhana and Sansamana Chikitsa of*
  - *Dhatu Kshaya*
  - *Avarana*
  - *Raktapitta*
  - *Mandagni*
- *Sthanika Karma*
  - *Tarpana*
  - *Ashchyotana*
  - *Nashya*
  - *Shirodhara*
- *Sarbadahika karma*
  - *Virechana*
  - *Basti*
  - *Rasayana Chikitsa*

- *Sebya Oushadhi*
  - *Kwatha*
  - *Rasaoushadhi*
  - *Rasayana Chikitsa*
- 3. Restoration of *Oja* as *Oja Kshaya* occurs in *Prameha*.

#### Sodhana

##### Nashya

The *Srotas* are usually obstructed by the deposition of *Ama*, hence the *Sirovirechana* i.e., *Nashya karma* with *Chakshushya Dravya* and *Kaya virechana* can be administered.

##### Virechana<sup>[18]</sup>

- In *Vataja- Eranda Taila* mixed with milk is given to treat it. *Eranda Taila* can be used to treat almost all the *Avarana*.
- *Rakta and Pittaja- Sarkara, Ela, Trivrut Choorna* mixed with *Madhu*
- *Kaphaja- Pugadi Virechana* is recommended

##### Basti<sup>[19]</sup>

*Basti* is considering as a therapy for both *Sodhana* and *Samana*. *Yapana Basti, Yasthimadhu Ksheera Basti, Panchatikta Pancha Prasritika Basti* and *Guduchyadi Ksheera Basti* may be administered in *Pitta* and *Rakta Avarana*.

##### Basti and Virechana<sup>[20]</sup>

*Virechana* and *Basti* with *chakshushya* drugs should be advocated to control *Vata*. *Sothahara* (anti-inflammatory) *Basti* can be instituted to reduce retinal/macular edema in general. In this context *Madutailika Chakshushya Basti* may be administered in Diabetic macular edema (DME) cases, as this *Basti* is beneficial in *Raktapitta* as well as this is *Chakshushya* in nature *Triphala Ghrita; Virechana Yoga (Triphala, Trivrita and Katuki), Takradhara (Takra and Amalaki), Pratimarsha Nasya (Anutaila), Rasayana Yoga*.<sup>[21]</sup>

##### Nashya- Dhara- Lepa

*Nasya, Shirodhara, Shirolepa* and *Shiropichu* treatments can be given in different stages of Diabetic retinopathy on the principle of "*Vata shaman* treatment for head and body and *pitta Shaman* treatment for eyes".<sup>[22]</sup>

##### Tarpana

The *Patoladi ghrita, Jivantyadi ghrita* and *Drakshyadi ghrita* can be used as *Tarpana*. The *Raktapitta Samaka, Ropaka* and *Rasayana* properties of these drugs reduces the hemorrhagic signs.

*Tarpana* with *Doorvadya ghrita* is effective in mild to severe NP Diabetic retinopathy and

Proliferative Diabetic retinopathy (i.e., *Rakta pittaja*).<sup>[23]</sup>

*Triphala* has anti VEGF properties. So the *Mahatriphala Ghrita* can be used in neovascularisation of Proliferative Diabetic retinopathy, *Pranavritta Vyanaaja*.<sup>[24]</sup>

*Patoladi ghrita Tarpana*<sup>[25]</sup> and *Jivantyadi Ghrita Tarpana* can be used in retinal ischemic conditions of Diabetic retinopathy, *Dhatukshyaja*.<sup>[26]</sup>

### Aschyotana

*Prapoundarikadi*<sup>[27]</sup> and *Manjisthadi*<sup>[28]</sup> *Ashchyotana* can be used in NP Diabetic retinopathy cases.

### Shamshamana Chikitsa

*Phalatrikadi Kwatha pana*<sup>[29]</sup> (equal quantity of-*Haritaki, Vibahtaki, Amalaki, Daruharidra, Haridra, Indrayava, Mustha*).

*Mahavasadi Kwatha*<sup>[30]</sup> (equal quantity of drugs of *Mahavasadi Kwatha-Vasa, Nimba, Patola Patra, Katuki, Guduchi, Raktachandna, Kutaja, Indrayava, Daruharidrya, Shunthi, Triphala, and Bhunimba*).

*Maharishi Charaka* mentioned to use *Mantha, Kashaya, Yava choorna leha* and *Laghu ahara sevana* which is easily digestible in *Prameha*.

*Triphaladi choorna, Triphaladi Kwatha, Mahavasadi Kwatha*,<sup>[31]</sup> *Vasakadi Kwatha*<sup>[32]</sup> and *Amrutadi Guggulu*.<sup>[33]</sup>

### Rasayana Chikitsa / Antioxidants

In Diabetic retinopathy modern modality includes Antioxidants. In Ayurved we have many Ayurvedic preparations having Antioxidant property. Those can be used for this purpose.

- *Amalakayas Rasayana* <sup>[34]</sup>
- *Aswagandharishtam* <sup>[35]</sup>
- *Sitopaladi choorna*<sup>[36]</sup>
- *Dashmolarishtam* (aqueous extract) <sup>[36]</sup>
- *Triphala Guggulu* (methanolic extract)<sup>[36]</sup>
- *Arjuna ghrita* (dimethyl sulfoxide extract) <sup>36</sup>
- *Giloy Satva* (hydro alcoholic extract)<sup>[36]</sup>
- *Vayasthapana Rasayana* (Methanolic extract)<sup>[36]</sup>
- *Nisha-amalaki* (aqueous extract) <sup>[36]</sup>
- *Drakshavleha* (Methanolic extract)<sup>[36]</sup>
- *Manjisthadi choorna* (Aqueous extract) <sup>[36]</sup>
- *Jeevaneeya Rasayana* (Methanolic, ethanoic and water extract) <sup>[36]</sup>
- *Triphala* (hydro alcoholic extract)<sup>[36]</sup>
- *Chavayanprash* (ethyl acetate, methanolic and aqueous extracts) <sup>[36]</sup>
- *Punarnavasatak Kwatha*<sup>[36]</sup>

- *Maha yogograj Guggulu* <sup>[36]</sup>
- *Chandraprabha vati* (Methanolic extract) <sup>[36]</sup>
- *Arogyavardhini vati* <sup>[36]</sup>
- *Laxmivilas rasa* (Aqueous extract) <sup>[36]</sup>

The above medicines have the *Rasayana* property, so in Diabetic retinopathy, instead of modern antioxidants those Ayurvedic Antioxidants can be used. Those Ayurvedic Antioxidants can rejuvenates the microvasculature and restore their structure and function.

The above modalities or treatment protocols can be used to treat the *Pramehajanya timira* i.e., Diabetic retinopathy which occurs because of the prolonged *Prameha*.

### DISCUSSION

*Madhumeha* causes *Oja Kshaya* leading to *Rakta* and *Mamsa Dhatu Kshaya* which ultimately produces micro vascular abnormality in retina. In *Avarana* the *Prana Vayu* obstruct the *Gati* and function of *Vyana Vayu*, results in the dysfunction of retinal circulations causing the sign of Diabetic retinopathy. The defective circulation i.e., occlusion, ischemia and leakage causing the sign of Diabetic retinopathy, like Neovascularization, Retinal hemorrhage, Dot or Blot Spot, Splinter hemorrhage, Retinal edema etc. The *Raktavrit Vata* causes the pre-capillary arteriolar bleed and the splinter hemorrhage, which are the sign of Diabetic retinopathy. In *Urdhwaga Raktapitta* the bleeding in the retinal layer is due to *Dhatu Kshaya* and *Avarana* of *Pranavritta Vyana Vayu*. Among the treatment modalities the *Virechana* both *Kaya* and *Siro Virechana* along with *Basti, Tarpana, Takradhara, Lepa, Ashchyotana* along with *Vasakadi Kwatha, Mahavasadi Kwatha, Phalatrikadi Kwatha, Triphaladi choorna, Triphaladi Kwatha, Amrutadi Guggulu, Prapoundarikadi and Manjisthadi, Eranda Taila, Patoladi ghrita, Jivantyadi ghrita, and Drakshyadi ghrita* with the Ayurvedic antioxidants, the *Rasayana Oushadhi* are useful to treat the Diabetic retinopathy.

### CONCLUSION

Diabetic retinopathy is more prevalent among the chronic Diabetic patients. Hence before treating we should know the pathogenesis of the disease. *Pratyaksha* of *Dhatu Kshaya, Avarana* of *Vata* and *Urdhwaga Rakta-Pitta* of the retinal layer can only be perceived by fundoscopy, FFA, OCT, B'SCAN, which are the diagnostic procedures. To treat the disease according to the Ayurvedic Principles/protocol, we must follow the Ayurvedic pathogenesis/*Samprapti*. With the *Pratyaksha* of the above clinical signs through the diagnostic procedures we can interpret those through

Ayurvedic terminologies and we can treat them accordingly. Basing on the above description we can conclude that the Diabetic retinopathy are caused due to the disturbance of *Agni, Dosha (Vata, Pitta and Rakta)* and *Dhatu (Rakta and Mamsa)* which can be managed with the treatment described for *Timira* and *Prameha/Madhumeha* having *Chakshushya* property along with the *Rasayana Oushadhi* as the Ayurvedic Antioxidants.

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