

Exploring Diabetic Retinopathy from An Ayurvedic Lens: Insights Leveraging Bioinformatics

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Abstract

Diabetic retinopathy is one among the target diseases for VISION 2025. The huge cost required for treatment, economic loss due to absenteeism from work etc. has made it as a great public challenge. Therefore it is in need of the hour to address the issues of diabetes mellitus with its complication Diabetic Retinopathy with all seriousness and it is quite essential to search for a affordable medical care for the same. Takradhara is proved to be effective in madhumeha and its complications. A local external procedure of Shirolepa is more cost effective and easily adoptable for all. Hence ,this article is to explain the detailed conceptual study of Diabetic Retinopathy as per Ayurvedic Perspective.

Keywords: Diabetic retinopathy, takradhara, madhumeha, shirolepa and diabetes mellitus.

INTRODUCTION

History of medicine is a fascinating subject as it is a saga of man's struggle against disease. As the civilization advances and as the disease pattern changes, the medical science also changes. Ayurveda is the system of medicine that evolved in India with a rationale logical foundation and it has survived as a distinct entity from remote antiquity to the present day. It is bestowed with 8 branches among which Shalakyana Tantra is given special importance as this branch deals with preventive, protective and curative aspect of diseases of urdhwanga.

Eyes were given supreme importance among the five sense organs i.e "Sarvendriyaanam Nayanam Pradhana. Acharya Charaka mentions that even if a person endowed with all other sensory facilities, strength, beautiful appearance etc, but without eye sight he will be useless as kudya. So eyes are said to be windows to the soul of a person and the instrument through which the living being view this universe [1].

The advent of globalization has brought dramatic change in human lifestyle all over the world.

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These changes brought alteration in the staple food habits and in level of physical activities of indigenous population which gave way to a set of non communicable diseases like Diabetes mellitus which in due course took embodiment of an epidemic.

There fore it is in need of the hour to address the issues of diabetes with its complication Diabetic Retinopathy with all seriousness and it is quite essential to search for a affordable alternative medical care such as Ayurveda for the same.

AIMS & OBJECTIVES

To study detail description of Diabetic Retinopathy as per Ayurvedic Perspective.

Conceptual Study

Diabetic retinopathy – ayurvedic perspective

Prameha is classified as a condition arising from an imbalance of kapha dosha and is considered a type of santarpanajanya vikara in Ayurveda. Described in the Asta Maha Gada by various Acharyas, Prameha involves excessive bahu drava sleshma along with abaddha meda, mamsa, kleda in the body, affecting components like sukra, shonitha, vasa, lasika, majja, rasa, and oja [2].

According to Madhavakara, any factor that disturbs kapha dosha serves as a causative factor for Prameha. This includes dietary and lifestyle factors that increase the qualities of kapha such as oily, cold, heavy, slow, smooth characteristics. Dosha plays a significant role as a causative factor for Prameha. Abhisyanda, considered a fundamental cause of all eye diseases, shares similar underlying causes. While direct references linking Madhumeha/Prameha to Timira are scarce, prominent Ayurvedic texts provide sufficient evidence supporting Timira as a potential complication of Madhumeha. Puujyapada Muni, in his work "Netra Prakashika," identifies Timira as a complication arising from Madhumeha. According to Charaka, bahudrasleshma, a type of excessive liquid body tissue, spreads throughout the body and leads to impairment. This drava sleshma moves upwards through the urdwagaami siras (channels directing upwards), settling in the drusti mandala (ocular region), manifesting specific symptoms related to vision. Probable Samprapti (pathogenesis) of diabetic retinopathy in ayurveda:

Role of Raktapitta in Manifestation of Diabetic Retinopathy

Diabetic retinopathy, classified as a Dristipatalagata roga in Ayurveda, primarily stems from the vitiation of Sira srotasabhisyandam and rakta vaha sroto dusti due to various dietary and lifestyle factors, particularly in patients with Prameha. Understanding the Ayurvedic perspective of diabetic retinopathy requires consideration of the general pathogenesis of eye diseases. Endogenous eye diseases primarily arise from Achakshyushya factors that disturb Pitta. This vitiated Pitta subsequently affects Pitta vaha srothas (channels related to Pitta) and also impairs rakta vaha srotas (channels related to blood flow) due to their interconnected nature (Ashrya Ashrayee bhava). The vitiated doshas, attracted to the eyes due to the nidana factors being Achakshyushya, move upwards through Jatroordhwa srotas (channels directing upwards) and eventually localize in the eyes, resulting in Sira abhisyanda (congestion of channels) [3].

The pathological process of diabetic retinopathy begins with the impairment of Raktavaha srotas, leading to microangiopathy characterized by Attipravriti (excessive circulation), Sanga (congestion), and Granthi (nodules) manifesting as hemorrhages, exudates, and venous beading, respectively. In terms of Siroabhisyandam in eye diseases, the affected Ashraya sthana (site of affliction) is the Srotas, the vitiated dosha is Pitta, and the affected dhatu (tissue) is Rakta. Prameha induces changes in the dristipatalam (visual pathway), significantly impacting vision. Initially, causative factors induce inflammation in vessels, altering their permeability, especially in the head region, a fundamental pathological change in the development of eye diseases [4].

If Sira abhisyanda persists, it progresses to affect netrasrotas (channels of the eye), where similar vascular changes occur due to the affinity of Achakshyushya factors towards ocular tissues. In the stage of netraabhisyandam (ocular congestion), further vitiation of Pitta dosha exacerbates the condition, leading to localized effects in the Dristipatalam (visual apparatus). Several predisposing factors contribute to the development of eye diseases associated with Prameha, including the patient's Pittaprakriti (constitution dominated by Pitta), hereditary factors, Pitta Kapha predominant seasons, dietary factors, and psychological stressors like anger and grief, all of which contribute to Pitta vitiation [5].

Vitiated Pitta combines with Rakta dhatu due to their similar properties. These factors collectively lead to significant alterations in the vessels of the Dristipatalam (visual pathway). The integrity of these vessels is compromised, resulting in increased permeability, which causes leakage and

hemorrhaging akin to blood sweating, a concept also described in Charaka's Raktapitta. Reduced circulation causes localized hypoxia, prompting the development of new fragile blood vessels. These vessels are prone to easy bleeding, contributing to the formation of exudates, neovascularization, and tissue proliferation, ultimately leading to degenerative changes in the retina [6].

In this context, Urdhwaga Raktapitta (hemorrhagic disorders affecting the upper parts of the body) can be likened to diabetic retinopathy, as it primarily affects all seven natural openings of the head. In the eyes, particularly due to their delicate nature and the impact of Achakshyushya factors, the vessels of the dristipatala (retina) are specifically affected.

Avaranajanya timira and diabetic retinopathy

According to Vagbhata, Madhumeha represents a chronic progressive stage of Prameha and is categorized into two types: Avaranajanya and Dhatukshyajanya. Madhumeha is classified as a Vataja type of prameha, and Vata can be aggravated through two mechanisms: Avarana (obstruction) and Kshaya (depletion). Avritta vatajanya madhumeha, caused by obstruction, is treatable with difficulty (krichhrasadhya), while dhatukshyajanya madhumeha, caused by depletion, is considered incurable (asadhya).

As per Charaka, "prameha anusanginam" indicates that diabetes mellitus is inherently concomitant in nature, meaning it remains persistently associated with its complications. Due to both obstruction and depletion mechanisms, all ten dushyas (body tissues) undergo depletion and manifest symptoms based on the affected dhatu (tissue). In the case of diabetic retinopathy, the primary affected dhatu is Rakta dhatu (blood tissue), although all dhatus are affected to some extent. The srotas (channels) primarily affected include Raktavaha srotas (blood vessels), mamsavaha srotas (muscle channels), and medovahasrotas (fat channels) [7].

Avarana Pranavritta vyana refers to the control and movement of Pranavayu and Vyanavayu in the body. Pranavayu acts as a controller responsible for sensory perception, while Vyanavayu facilitates conduction processes including neural and cardiac functions. When Pranavayu restricts the movement of Vyanavayu, it can lead to sensory impairment either in individual senses (homonymous) or across all senses (heteronymous), akin to a vegetative state or deep coma when affecting all senses. In diabetic retinopathy, Pranavritta vyana can cause vascular disorders, initially leading to retinal ischemia followed by changes such as neovascularization, cotton wool spots, and intra-retinal microvascular abnormalities (IRMA). Early breakdown of the blood-retinal barrier (BRB), formation of hard exudates, and macular edema are subsequent symptoms. Manifestations of Pranavritta vyana include loss of sensory perception (Sarva indriya sunyata), memory loss (smriti kshaya), and loss of strength (bala kshaya) [8].

Raktavritta vata involves the accumulation of Rakta dhatu due to etiological factors described in the Vidhisonitiya adhyaya of Charaka. This accumulation impedes the movement of Vata dosha, disrupting normal circulation and leading to stagnation in Raktavaha srotas (blood vessels). Symptoms of Raktavritta vata include burning sensation in the skin and muscles (Twakmamsa antarajadaha) and the appearance of hemorrhages and retinal edema (Raktayukta sotha mandala), which correlates with conditions like splinter hemorrhages and IRMA in diabetic retinopathy. Many etiological factors contributing to Raktaja vyadhi (blood-related disorders) resemble those of Madhumeha and Prameha in Ayurveda. Conditions such as Akshiragam (ocular disorders), Tamasyatidarshanam (vision impairment), and Raktapitta (bleeding disorders) are specifically linked to vision defects in diabetics due to microvascular complications [9].

In the context of diabetic retinopathy, initially characterized by Raktakshya (blood deficiency) and ischemia, later stages involve increased blood circulation leading to hemorrhages and exudative changes. Treatment for Raktavritta vata, according to Vataraktachikitsa, focuses on normalizing

obstructed Vata dosha movement. Charaka recommends Basti (therapeutic enema) as optimal for this condition, aiding in alleviating symptoms of diabetic retinopathy.

Management of Diabetic Retinopathy in Ayurveda

Treatment aims at correcting and preventing the underlying etiopathological mechanisms (Samprapti vighatana). Preventing madhumeha (diabetes) is crucial, with therapies targeting Urdwaga Raktapitta (upward-moving blood disorder), addressing Avarana (obstruction), and preventing Agnimandya (digestive impairment). Chaksusya (vision-enhancing) drugs and regimens are essential.

Recommended treatment approach

Agni chikitsa: Correcting tissue-level Agnimandya (metabolic fire) with Dipana Pachana drugs such as Trikatu churna and Jatharagni, tailored to individual needs.

Srotas sodhan chikitsa: Purification therapies (Sodhan chikitsa) to clear impurities accumulated at the capillary level, with Virechana recommended. Nasya with oils from chakshyusya drugs aids in upper respiratory and ocular canal purification.

Raktapitta samaka chikitsa: Managing blood disorders and Raktaja vyadhi with treatments like Virechana, Upavasa (fasting), and Raktamokshana (bloodletting). Langhana (therapeutic fasting) is advised per Yogaratnakara and Chakradatta for eye ailments, particularly in diabetic retinopathy.

Avarana chikitsa: Treating Avarana with non-obstructive, lubricating (Snigdha), and channel-purifying (Srotosudhikar) measures. Yavana Basti and mild cleansing therapies are suggested based on patient strength. Rasayana drugs like Shilajatu, Guggulu, Chyavanprash, and Brahma rasayan help prevent and treat Avarana-induced disorders, beneficial in managing oxidative stress linked to diabetic retinopathy and Ama theory related to diabetes development.

Sthaniya chikitsa: Addressing Kapha Nirharana (reduction of Kapha) with Ascyotana (eye wash) and Kaphapittahara drugs. Srotorodhahara treatments like Takradhara (pouring medicated buttermilk), Shirolepa (application of herbal paste on the head), and Talam (herbal paste application on the crown) help reduce kapha aggravation in pitta-dominant eyes.

Capillary leakage and exudates: Administering sopha hara (anti-inflammatory) drugs such as Haritaki and Punarnava to mitigate capillary leakage and exudates.

Ery And Lifestyle Recommendations

Patya (favorable) ahara and vihara: Including vision-enhancing foods like Triphala, clarified butter (ghee), green gram (mudga), Shatavari, and foot care as per prameha chikitsa, including older barley, wheat, shastika rice, jungle meat, bitter vegetables, etc.

RESULT AND DISCUSSION

Recently the prevalence of Diabetic Retinopathy is raising among the diabetic population. Despite Diabetic Retinopathy causing eventual blindness, only a few visual or ophthalmic symptoms are observed until visual loss develops. Therefore, early medical interventions and prevention are the current medical strategies. Most common conventional therapies available for Diabetic Retinopathy are LASER and Anti VEGF injections. These are invasive procedures requiring frequent surgical interventions with no promising vision restoration. Current treatment of Diabetic Retinopathy rarely improve visual function and are limited to surgical options in advanced stage, with excessive side effects like LASER therapy is been reported to damage neural tissue leading to retinal damage and scarring resulting in further deterioration of vision and even therapeutic agents like Intra ocular injections becomes a financial burden to common man. Hence it is necessary to find an effective and economical line of management through Ayurveda to prevent, delay or arrest the progression at different stages of Retinopathy in diabetic patients^{7,8,9}

CONCLUSION

A local external procedure of Shirolepa which is also said to have equal effect of takradhara has been taken in this study to observe its efficacy as it is more cost effective and easily adoptable for all.

The procedure of shirolepa with its passive diffusion mechanism has made the active ingredients of drug to enter into microcirculation and reach ophthalmic arteries to bring about desired effect and helping in proper nourishment of retina to prevent further leakage.

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