



CONCEPT OF OCULAR PHYSIOLOGY IN AYURVEDA

**Dr. Keshab
Chandra Barman**

MS (Shalakya) BHU, Ph.D. (Eye Disease), GU, Professor & HOD, Dept. Shalakya
Tantra, Govt. Ayurvedic College, Guwahati-14

ABSTRACT Ocular physiology is a core knowledge component for these disciplines and yet is often difficult to understand. However, this study clearly conveys the simple elegance of relationship between structure and function that is hallmark of understanding the physiology of the eye. In Ayurvedic classics it is clearly mentioned that the eyeball is composed of Pancha Mahabhutas and Dhatus structurally. Moreover it is also mentioned that the physiological activities of the eye, eg. Formation as Aqueous humour (Tejjala) and its drainage, physiology of vision etc. are find out from the normal physiological function of the different dosas, dhatus & srotas etc. Through this study a strong emphasis is placed on understanding the normal function of the ocular tissues, so that the student of Ayurvedic Science can understand how dysfunction can lead to ocular diseases.

KEYWORDS : Ocular physiology, Netrakriya Teja Jala, Srotas

INTRODUCTION:

The eye is a peripheral sensory organ (gyanendriya) of vision (Rupagrahanartham). To enable to do so, its parts must be in perfect condition to perfect vision. It is observed in Ayurvedic literatures, that the nutrition ingested in different forms furnishes raw materials required for the synthesis, nourishment and sustenance of the different structural and functional elements of the body, viz., sharira dhatu and sharira doshas, including the physiology of the sensory components (e.g. eye, ear, nose, tongue and skin etc.) and various other structures of the body¹ (cha. Sut. 28; 4(3), 4(4), 4(5)).

The formation of aqueous humour, circulation of aqueous humour and physiology of vision are the important aspects of physiology of the eye².

AQUEOUS HUMOUR:

The aqueous humour is a clear fluid filling the anterior and posterior chamber of the eye is known as Teja or Tanu jala in Ayurvedic literatures. According to the Dalhana's writing, the word Teja means alochakam (i.e. perception) and it is derived from the siragata rakta (venous blood). The jala (fluid) is derived from the rasa dhatu. (As chap 2:4)³. In this context it is presumed that the Tejjala must have a refractive index which is 1.336 as mentioned in modern ophthalmology^{4,5,6}. The viscosity of this Tejjala is maintained by the kapha, as because- the sliminess is one of the most important physiological qualities of this dosa: so the viscosity of Teja-jala is 1.025-1.040 (as mentioned in modern science). Sushruta and Vagbhata has mentioned, that this Teja-jala is covered by a swasa patala, known as Teja-jala srith patals. This ancient conception gives prove, that the idea of aqueous humour also exist in Ayurvedic ophthalmology.

AYURVEDIC CONCEPT IN THE FORMATION OF AQUEOUS HUMOUR:

The formation of aqueous humour doesnot mentioned in Ayurvedic Samhitas. But a theory will be made after observing the physiological and metabolic functions of the body elements, e.g., sharira dhatus, and sharira dosas etc. It is observed in Indu tile: (3.15) that the Teja-jalashrita patala is. manifested from the rasa-rakta (i.e. plasma) which is derived from the siragata rakta (venous blood)⁷. Dalhana has proved the predominancy of alochaka pitta in Teja jala where the rasadhathu takes place. Again he observed that this Teja is derived from the siragata rakta. (As chap 2.4)⁸. In addition, it is the rasadhathu, the analogue of plasma, which the source of all body secretion is seen from Ayurvedic sutra. The meaning of rasa itself is rakta and rakta itself is rasa (Ayu sut. Pr. II, sutras 18-19, P.100)⁹. Yogananda nath's commentary on this sutra runs as follows. "Rasa becomes rakta, since it is formed of one rasa, elsewhere in the same work rakta has been described as rasa (protoplasm)- +ÉPMÉä´É´ ¨´É&´ +ÉPMÉä´É´ ¨´ÉÉÉÉPÉÖ and the rakta itself is both rasa-rakta (plasma blood) (Ay sutra IX and X Pr.8; P257)¹⁰. The circulating rakta is really rasa; the analogue of plasma and that, it is from this fluid that various secretions and excretions are formed. This is important in the context of the study of the special kinds of extra-cellular and intracellular fluids. Such as Kledaka, avalambaka, bodhaka, sleshaka and Tarpaka kaphas etc. Tarpaka kapha, located in the head, is said to nourish and soothen the

indriyas by virtue of its snehana (oily) quality (su sut. 21;14, A.H. sut 12;18)¹¹. In the context of tarpaka, the reference to indriyas relate to fluids contained in the eye viz., aqueous humour and vitreous humour etc.

ROLE OF SROTAMIS IN THE FORMATION OF AQUEOUS HUMOUR:

There is magnificent role of srotamsis, which are spreaded to the tissues of the eye for the formation of aqueous humour. Sushruta is seen to excluded siras (veins), and dhamanis (arteries) from the perview of srotas. In his views Dhamani have khani (pores) (Dalhana on susha 9.10)¹² in their wall through which they secrete the rasa and supply to all parts of the body, very much like the minute passage present hi a lotus stem (su. Sha 9.10)¹³. Vagbhata has also observed: "Rasa which filtrate through the minute pores of the srotamsis which are distributed extensively in the body, very much like the minute channels, present in the lotus stem (AH sha 6.46)¹⁴.

Charaka has been more explicit about the exact nature of and functions performed by the srotoses. He observed srotamsis serve as ayanamukha (secretions). Amarasimha has described mukha as a synonyms of ÉxÉ&´É´ ¨´gÉ meaning a structure through which things get out (or get in) (Amarakosha) means semi permiability of the capillary walls.

Charak's defination of srotas as ¨´ÉhÉÉÉÉ´gÉäxÉÉAEÉ´É is also similar to the above. Chakrapani datta in his commentary on the passage under reference has interpreted the term ayanani as the place of entry (or exit). Keeping the views of different Ayurvedic scholars, in mind, it will be concluded that the Poshaka dhatus pass through the ayanamukhas of srotases (dhamani etc.) and are carried away by rasa (tissue fluid) and then are absorbed into the circulating rasa-rakta (plasma). This rasa-rakta (plasma) again filtered by the srotamis (capillary walls) and rasa (Teja-jala) may formed and filling the chambers of the eye.

Thus starling concept which assumes the ultrafiltration of blood constituents is modified to include the concept of a porous capillary wall with pore numbers dimensions and shapes varying in capillaries of diverse tissues, and operation of a rapid diffusion process across the capillaries (Abraham white et. al Principal of Bio Chemistry P.734, 1954 edition)¹⁵.

Modern tends, relating to the phenomena of semi permability and selectivity of capillary walls and plasma membranes, summed up above are significant. They are reminiscent of the views advanced by Punarvasu Atreya, Sushruta, Vagbhata, Chakra Panidatta and Arundatta on the two aspects of the functions of srotamsi, viz. as channels of transport of nutrient materials (rasa) and waste products on the other hand and ttic to and from movement of material through the mukhass or pores present in their walls on the other.

The views of Punarvasu Atrey cited earlier, that the structural peculiarities i.e. the elements that compose of the srotamsi, the

materials they transport, the tissues (dhatu) to which they serve as channel of transport and the regions of the body they cover constitute the significant features of srotamsi, finds an echo in modern views relating to the properties of capillary walls and plasma membranes of cells. Thus the teju-jala is formed like this manner, followed by secretary, ultrafiltration and diffusion mechanism of the capillaries through their respective pores.

CIRCULATION OF AQUEOUS HUMOUR:

The circulation of aqueous humour is essential for regulation for the intra ocular pressure as well as for metabolic activity of the intraocular structures.

The formed aqueous humour is collected in the posterior chamber, flows through the daivachidra (pupil) into the anterior chamber and finally escapes through the exit channels (srotas) at the angle of the anterior chamber. The aqueous filters through the minute pores of srotamsi of the different udakabaha or rasabaha srotas resides in the eye proper (e.g. trabecular mesh work at the angle of the anterior chamber into the canal of schlemm and from a number of aqueous veins and different channels drain into the episcleral veins and intrascleral venous plexus respectively). When there is khavaiguna of the srotas, means the blockage of those channels may cause the raise of intraocular tension i.e. glaucoma (Adhimantha)¹⁶.

AYURVEDIC CONCEPT IN PHYSIOLOGY OF VISION

Ancient medical science has believed that the human beings are made from the five basic elements called the pancha mahabhutas (i.e. shariram oanch maha bhautikam). By the end products of the mahabhutas, the dristi of the eye is formed. Hence in dristi, the masurdaid matra indicates the kasa or lens of the vabarakritim patalas indicates to the cornea, iris and retina respectively (ss utt8)¹⁷. These structures of the eye acts as refractive media, through which the rays of light easily enters into the eye and creates the image of an object over the retina. The object is to be visualised by the eye, when it is in contact with the atma (soul) and manas (mind).

As stated by charaka, Manas is an essential ingredient of the process of pratyaksar (direct Vision) with other constituents like the atma indriya (sense organs) and indryarthas (object of senses) pratyaksha does not occur if the atma in drias and their arthas are there, while manas is elsewhere (cha. Sha 18-19)¹⁸.

Much more important is the observation of bhela that, the manas receives intimations from the external world, through the five sense organs in the form of tactile, olfact-impulses.

It is mentioned in the atharveda, that the vayu is the master of the manas and both are located in the mastiska (brain) mana and vayu gets together and performs the all activities of the sense organs like vision etc. (atharvaveda 10-2-26)¹⁹.

Charaka's reference to the shira (head) as the seat of knowledge or buddhi, indryarthas, atma, manas and mental concepts also point to the braini (cha sut 17:12)²⁰ the five buddhindrya (the five special senses or extroceptors), obviously corresponds to the areas in the cerebral cortex (dryabuddh) where the five kinds of sense e.g vision etc. are experienced. The events of the external world are intimated to the manas through the buddhindrya to the indryabuddhis (winter and bayliss, human physiology 1948 edn)²¹.

In this way the phenomena of the vision is performed by the mind in correlation with the atma, indriyas and vayus.

Other views of the vision as stated by the sushruta, is that the alochaka pita or alochakagni located in the eye and performs the vision (ssutt. 21.13)²² alochakagni can catch the image of the external object presented to the eye due to its tajas qualities and the vayu located in the brain.

Vagbhata (AH12.13) also agreed with the sushruta's views²³.

Bhela, has mentioned two aspects of alochakatta, viz, chakshurvaisesika and buddhivaisesika. Atreya punarvasu comments that this alochakaka pitta is excited by the varsha (rain), sheeta (cold) and atapa (sun). The chakshurvaisesik alochaka pitta performs its function after correlation of the atma and manas when the indryarthas has made its contact with it.

Buddhivaisesika alochakapitta is the factor which enables concentration, response and cogitation (bhel samhita)²⁴.

According to nyaya, indrya tejas is that which manifests the colour alone. The location of this tejas is said to be the pupil (nyaya system of philosophy, as regards the tejasaindriya is responsible for the discrimination of colours is of importance.

Modern contributions to the physiology of vision confirm in a general sense. The earlier Ayurvedic and nyaya findings referred to above the furnish details lacking in the former. The initial phenomena of vision are concerned with retinal pigments which absorb light.

It is presumed that the pitta's like eanjak. Alokaka and bhrajake may have to be grouped together under one category, as their functions are essentially the formation of different kinds of segments viz, the pigment in the retina responsible for vision and colour perception.

REFERENCES:

1. Charak Sutra 28; 4(3), 4(4), 4(5)
2. H.V. Nema textbook of Ophthalmology
3. Astanga Sangraha 2:4
4. H.V. Nema, Text of Ophthalmology
5. H.V. Nema, Text of Ophthalmology
6. Sushruta Samhita Sut. Upasargik Adhyaya
7. Indi Tika 3.15
8. Astanga Samgraha 2:4
9. Ay. Sutra Pr. II, Sutras 18-19, P-100
10. Ay. Sutra IX and X Pr. 8, P.257
11. Susruta Samhita, Sutra 21:14 & Astanga Samgraha Sutra 12:18
12. Dalhana on Sutra 9:10
13. Susruta Samhita Sharira 9:10
14. Astanga Hridaya Sharira 6:46
15. Abraham white et.al. Principle of Biochemistry, P.734, 1954 edition.
16. Text book of Ophthalmology by H.V. Neema
17. Susruta Samhita Utt. 8
18. Charaka samhita Sharira 18.19
19. Atharva veda 10-2-26
20. Charaka sutra 17.12
21. Winter and bayliss, human physiology 1948 edn.
22. Susruta uttara 21:13
23. Astanga Hridaya 2:18
24. Bhel Samhita