

**AN IMPERATIVE REVIEW STUDY ON CONCEPT OF
OPHTHALMOLOGY IN AYURVEDA IN THE PURVIEW OF
RACHANA SHARIR (HUMAN ANATOMY)**

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ABSTRACT

Ophthalmology in ayurveda is a branch of a perfect science strictly based upon ayurvedic principles. With the changing concepts of health and disease and shifting scenario of health needs of the present times, there has been an amazing arousal of interest which is likely to be accelerated with the growing trends of information technology, economic globalization and industrial activism. In ancient classics literature regarding Ophthalmology and Eye Hygiene has been available but information is scattered in different books. There is concrete need for comprehensive literary study of the anatomical and clinical aspects of Ophthalmology, from the available *Ayurvedic* literature. Present review article can be useful to know that the concept

of Ophthalmology was well known to Ayurveda with its basic physio-anatomical knowledge. This article is a collection of data regarding Ophthalmology from all *Ayurvedic Samhita* to give a detailed description of ancient knowledge about Eye. This article also highlights the review about embryology of Eye, anatomy of Eye and Ophthalmic problems with scientific analysis of the *Ayurveda* ophthalmic health.

KEYWORDS: Ophthalmology, *Netra*, *Netra Rogas*, *Drishti*, *Ayurveda*.

INTRODUCTION

History is the root of knowledge in any scientific research. Which is known only when one has the comparative knowledge of the past and the present in a particular subject. In the

initial stage of planning in any scientific work, it is very important to know the evolution of present knowledge and the basic idea given by ancient scientists. History of *Darshanendriya* dated back to *vedic* era, where we find in *Rigveda* many references about the divine Physicians, *Ashwani kumar* and *Lord Indra*. They revived the loss of eyesight of *Rishis* and replacement of head with other animals. The description of sensory organs in *kensutra* of *Atharvaveda* is described systematically with specialty of the eye ball in the skull over the vertebra of Neck etc, along with the seven apertures situated in the head. There is also description of various drugs for the improvement of eyesight, *Ayurveda* was further divided in to eight branches viz *Shalya Tantra*, *Shalakya Tantra*, *Kaya chikitsa*, *Bhoot vidya*, *Kaumaryabhritya*, *Agada Tantra*, *Rasayana Tantra*, & *Vajikaran*, Ashtang Ayurveda further developed & got divided into the present day status. At this stage “Sharir Rachna” has also become one of the important parts of it. Anatomically, study of eyeball is mainly described in *Rachna Sharir*.

The diseases of Eye, Ear, Nose, Throat, Whole of Oropharyngeal cavity, dental, and shira (Head) as describe by King *Videha*. The disease of eye has received the maximum attention in the classics of *Ayurveda*, indicating that probably *Ayurvedic* ophthalmology had been the most developed branch of *shalakya* in ancient times. *Acharya Nimi (Videha)*, *Bhadrak*, *Shaunak*, *Karal Bhat*, *Chakshushyena*, *Satyaki* etc. contributed greatly development in the field of eye diseases.

VEDAS AND PURANAS

In *Rigveda* the *Ashvini* brothers revived the eyesight of *Rujrasva Kakshivat* and *Kanva*. In *Atharvaveda* synonyms of *Netra* are given as *Chaksu*, *Chakshmani*, *Netra*, *Akshi* etc and elaborate description about *Anjana*, its properties and mode of administration in ocular disorders and for improvement of the eyesight are also available. In *Jaiminiya Brahmana*, *Andhatva* (Blindness), *Netrasrava*, treatment of *Netrasrava* and consequent blindness, and saturation of eyes with *ghee* are mentioned.

In *Shatpath Brahmana* diseases of eye as well as *ghrita* as excellent *Chaksushya*) are also mentioned. In *Brihada Aranyakopnishad* different structures of eye ball has been said to be evolved from different deities as *Ashrumarg* from *God Aditya*. A unique treatise, *Chaksushyopanishada* was composed in which 40 to 45 mantras are explained for improvement of vision through *Suryopasana* (worship of God Sun). *Pilla*, an eye disease is added by *Katyayana*. *Kautilya's Arthashastra* in *Mouryan* period contains references of

Anjana used to restore vision. *Banabhatta*, the famous cortege of *King Harshavardhan*, in his poetice works, *Harshacharita* and *Kadambari*, has mentiond a term ‘*Ashrusrotas*’ for lacrimal ducts.^[1]

Samhita Period

Charak Samhita had mentioned few details as for as eye is concerned. It had mentioned four types of *Netra Roga* in *Sutrasthan* and ninety six numbers of eye diseases indicated in *Chikitsasthana*. Few references of eye diseases like *vartmasankocha*, *Timir*, *Pilla roga*, had found in the text. Perhaps it followed *Kalal* the contemporary of *Videha* who had same concept in eye disease. *Sushruta Samhita* elaborately described the disease of *Shalaky Tantra*, with Anatomical and physiological descriptions & diseased states of different parts of the eye. *Acharya Sushruta* mainly quoted *Videha* as the author of *Nimi Tantra*.^[2]

- ***Videha Tantra***: - written by *Acharya Videha*, was the first author who described *Shalaky Tantra*. *Sushruta* followed him in describing *Shalaky Tantra* disease.
- ***Nimi Tantra***: - First to describe disease of *Nimesha* (eyelids) & was the leading *Shalaki*. He would have been a lid specialist.
- ***Satyaki Tantra***: - the father of *satyaki Sect*, described cataract operation which is practiced even now as *Couching Technique*.

Acharya Sushruta has been described *Netra roga* in a systematic manner. Where in 76 diseases of the eyes are describe with respect to their classification, symptoms and treatment It is also emphasized that *Shalaky Tantra* is as deep as ocean hence it is impossible to describe all of them in detail. Yet he described diseases in a systematic manner as per the anatomical component of the eye.^[3]

Eyes are regarded the windows of the soul. A pair of sparking eyes are the most beautiful and attractive features in a person. One need not emphasize the importance of the eyes as “nothing in this world is as good as perfect, unaided vision”. Eyes were greatly valued by ancient Indians and much importance was accorded to their protection.

Embryology of *Netra*(Eye)^[4]

Acharya Sushruta has been explained origin of *Anga*, *Pratyanga*(body parts) in 3rd month of foetal life although it is very minute, in 4th month it is clear and *garbha* perceives the *Indriya Artha*(Sense). So according *Acharya Sushruta* 4th month is the stage of *Dauhridaya*(two

heart)of pregnant mother and in 7th month *Anga, Pratyanga,vibhaga* is almost complete. The evolution of all sense organs occurs in the 3rd month of intrauterine life and completes at about 7th month. There were differences in opinions among ancient *Acharyas* regarding the evolution of *Netra* as follows.

- a) According to *Kashyapa* and *Bhela*, eye is the first organ to develop in the fetus.^[5]
- b) *Acharya Videha Janaka* opines that all *Indriyas* are the foremost organ to develop in the fetus as they are the *Adhithana* of *Buddhi*.
- c) According to the opinion of *Shaunaka*, *Shira*(head) is the first organ to develop, as it is the seat of *Indriya* (sense organ).
- d) *Acharya Atreya* and *Dhanvantari* conclude that all organs in the human body develop simultaneously

Even though eye is formed with combination of *Panchmahabhuta*, but *Tej Mahabhut* is main and major contributing *Mahabhuta* among the five *Mahabhuta*

Table No.1 shows *Panchbhoutika* concept of embryogenesis of eye

S.No.	Parts of <i>Netra</i>	Contributing <i>Mahabhoota</i>
1.	<i>Mamsabhaga</i> (Muscular part)	<i>Prithvi (Bhu)</i>
2.	<i>Shwetabhaga</i> (White Part)	<i>Jala</i>
3.	<i>Raktabhaga</i> (Red Part)	<i>Tejas/Agni</i>
4.	<i>Krishnabhaga</i> (Black Part)	<i>Vata</i>
5.	<i>Ashrumargas</i> (Tear channels)	<i>Akasha</i>

Acharya Vagbhata has attributed the origin of *Indriya* to *Kapha* and *Rakta vaha* srotas.

Table No.2: shows embryological classification of eye according to *Acharya Vagbhata*.^[6]

S.N.	Srotas	Eye Structure	Bhavas
1.	<i>Kapha Vaha</i>	Sukla Mandala (Sclera and conjunctiva)	Pitruja
2.	<i>Rakta Vaha</i>	Krishna Mandal (cornea and Iris)	Matruja
3.	<i>Kapha Rakta Vaha</i>	Drishti Mandala (Pupil, and their function)	Both

In *Upanishada* period, ocular anatomy was depicted in philosophical manner. In *Brihad Aranyaka Upanishada* different structures of eyeball were said to be evolved from different Gods as follows.

Table No 3: shows different structures of eyeball evolved from different deities.

S.No.	God Name	Part of <i>Netra</i>	Part of eyeball
1.	<i>Rudra</i>	Reddish part of eye ball	Blood vessels
2.	<i>Parajanya</i>	Liquid portion	Aqueous & Vitreous humour
3.	<i>Aditya</i>	<i>Kaninika, Ashrumarga</i>	Lacrimal apparatus
4.	<i>Agni</i>	Blackish portion	Cornea, iris
5.	<i>Indra</i>	Whitish part	Conjunctiva, sclera
6.	<i>Prithvi</i>	<i>Adho Vartma</i>	Lower eyelid
7.	<i>Akasha</i>	<i>Urdhva Vartma</i>	Upper eyelid

The colour of the Eye is also determined by the association of *Dosha* and *Dhatu* with *Tejomahabhoota* as below.

- *Rakta Dhatu* → in association with *Tejo Mahabhoota* → ***Raktakshi***
- *Pitta Dhatu* → in association with *Tejo Mahabhoota* → ***Pingakshi***
- *Kapha Dhatu* → in association with *Tejo Mahabhoota* → ***Shuklakshi***

Anatomy of *Netra* (Eye) in *Ayurveda*.^[7]

The detailed description of the anatomy of *Netra* is available only in *Sushruta Samhita*. *Shir* (head) is the *Uttamanga* (supreme part) of the human body, when compared to all other parts. It is the seat of life for living beings. All the *Indriyas* (senses) are situated in and supported by the head. *Netra* is situated in the *Netra- Kosha*, which forms the shelters for two *Netras*, but there is only one *Chakshurindriya* (eye sense). These *Netrakotara* (eye orbit) are the two among the seven external openings of the *Shir*. Two terms are mentioned for eye viz. *Nayana* and *Netra* as narrated by *Acharya Sushrutha*. Both are suggestive as shape.

The shape of *Netra* has been described as *Suvrittam* (spherical from all sides), *Gostanakaram* (like the teat of cow i.e. oblong shaped or oval shaped) and *Nayana Budbudam* (like a bubble floating on the water i.e. round in shape and soft in consistency and glossy/glistening in character) which denotes the shape and consistency of the *Netra*. The measurements of the eyeball were described by *Sushruta* in terms of *Anguli* (digit) like any other organ but, *Anguli* in context to measurement of *Netra* is equal to *Swangushtodara* in the words of *Sushruta*, which has been supported and clearly written by the commentator *Dalhana*. While describing the dimensions of eye, *Sushruta* had given two dimensions – 2 *Angula Bahulya* and 2½ *Angula Sarvata*.

Aksi Bandhana

Siras, *Kandaras*, *Meda* and *Kalkasthi* with their excellent properties, Which they attain inherently keep both eyes in their normal position. *Sleshma* along with *Siras* take part in the *Bandhana Karma* of the eye. Here, *Dalhana* opines that *Sira* in the reference includes both the *Sira* and *Dhamani*, but *Kandara* is meant for *Snayu* and *Peshi*. Thus the different parts of the eyeball are held together by blood vessels, muscles, fat and a black substance. Beyond this black substance, there is a mass of whitish substance through which course the blood vessels.

Siras and Dhamanis

There are 38 *Siras* which transport *Vata* (8), *Pitta* (10), *Kapha* (10) and *Rakta* (10) in both the *Netra*. *Acharya Vagabhatta* has described 56 *siras*, out of which 4 help in *Unmesha* and *Nimesha* (opening & closure of eyelids). Among 4 *Dhamanis*, there are two *Dhamanis*, one in each eye for *Roopavahana* (Visual impulses) and rest two for drainage of *Ashru* (tears) in the *Netra*.

Peshi and Snayu

Mandala (circular) type of *Peshis* (muscles) and *Prithu* (broad) type of *Snayus* (ligaments) are found in the eyes. There are two *Peshis* and thirty *Snayus* in both the eyes. The *Mandalakara Peshis* may be orbicularis oculi muscles while the *Snayus* may be the tendons of the extra-ocular muscle.

Asthi and Sandhi: There are six *Sandhis* which have been described earlier and a *Tarunasthi* (cartilage) is also present in the *Akshi-kosha* (lids) i.e. Tarsal plates.

Relation of Marma and Eye

Marma are vital points of the body, trauma to which may result in various complications. Two *Marma* mainly *Apanga* and *Avartha* are related to *eye*. *Apanga marma* is situated on outer side of the orbits below the lateral end of the eyebrows, $\frac{1}{2}$ *angula* in size and is a *Sira Marma*. *Avartha Marma* is situated above the lateral end of eyebrow, of same size and *Sandhi* type of *Marma*. Any injury to these sites may result in blindness and diminished vision. *Shringataka Marma* are four *Sira* types of *Marmas* of *Mushthi Pramana* (fist sized), situated in the middle of the *Sira* supplying nutrition to eye, ear, nose and tongue. Any injury to this *Marma* leads to death.

Physiology of Eye in Ayurveda

There is no description about concept of physiology of eye in *Salakya Tantra*. But the mechanism of perception of objects by eye is described and it is based on the *Darshana Siddhanta*. *Tarka Sangraha* considers *Netra* as a *Buddhindriya* (sense organ). The function of *Buddhindriya* (sense organ) is described as perception of object, in short the knowledge gained by the combination of *Indriya* and its object i.e. *Artha*. These eye diseases described by *Acharya Sushruta* are uniquely classified rendering the ophthalmologist to understand them in a better way regarding occurrence, treatment and prognosis as follows.

- i) **Based on Doshas-** *Vataja, Pittaja, Kaphaja, Raktaja, Sannipataja*
- ii) **Based on the surgical procedure-** *Chedyā, Bhedyā, Lekhya, Vedhya, Ashastrakrita.*
- iii) **Based on the prognosis-** *Sadhya, Asadhya, yapya,*
- iv) **Based on Site-** *Vartmagata, Sandhigata, suklagata, Krishnagata, Drishtigata, Sarvagata, and Vahyaja.*

Eye is the site of *Darshanendriya*. History of the *Eye* is dates back to Vedic era. We find in the *Rigveda*, many references about the successful ophthalmic surgeries carried out by *Ashwini Kumaras*. The word *Timira* is not of Vedic origin, whereas if it's meaning i.e. *Andhakara* or sequel of it i.e. *Linganashaka* (loss of vision) is taken into consideration then one can get many references in the Vedic literature also. In *Rigveda*, a reference is found where the *Ashwini Kumaras* are said to have restored the eye sight of *Rijashva* and *Kanva* while in another place in the same text; there is a reference of God *Indra* doing correction of vision of blind *Paravrija*. In *Yajurveda*, also hymens are seen to restore the eye sight. *Timira* is not described in any of the *Upanishadas*. The worshipping of God *Sun* vividly advocated for the renaissance of eyesight is explained in *Netropanishada*.

Most of the acharya have classified the eye diseases according to the site of occurrence of the diseases. The eye diseases according to various ancient scholars are tabulated as follow.

Table No. 4: shows the various numbers of *Netra roga* According to different *Acharyas*.

Sr. no.	Name Of <i>Acharyas</i>	No. of <i>Netrarogas</i>
1	<i>Acharya Sushrut</i>	76
2	<i>Acharya Charak</i>	4
3	<i>Acharya Vagbhata</i>	94
4	<i>Acharya Sharangdhar</i>	94
5	<i>Acharya Bhavprakash</i>	78
6	<i>Acharya Yoga Ratnakar</i>	76

Table No.5: shows Distributions of Netra Rogas according to different Acharyas according to their locations.

Sr. no.	Netra Roga	SS	AS	AH	MN	YR	BP	Sa.S	KT
1	Vartmagata Rogas	21	24	24	21	21	21	24	27
2	Pakshmagata Rogas	-	-	-	02	02	02	-	-
3	Sandhigata Rogas	09	09	09	09	09	09	09	09
4	Suklagata Roga	11	13	13	11	11	11	13	13
5	Krishnagata Roga	04	05	05	04	04	04	05	06
6	Dristigata Roga	12	27	27	12	12	12	27	25
7	Sarvagata Rogas	17	16	16	17	17	17	16	16
8	Others(Bahya)	02	-	-	02	02	02	-	-
9	Total	76	94	94	78	78	78	94	96

SS = Sushruta Samhita, BP = Bhavaprakash, AS = Astanga Sangraha, Sa.S = Sharangadhara Samhita, AH = Astanga Hridaya, MN = Madhava Nidana, KT = Karala Tantra, YR = Yoga Ratnakara.

According to dosh bheda, Netra roga are of four types as below.

1. Vataj Netra Roga.
2. Pittaj Netra Roga.
3. Kaphaj Retra Roga.
4. Sannipataj Netra Roga.

According to sthanbhed, akrutibhed, doshbhed, there are 96 types of eye diseases.

Table No. 6: shows total number of Netra roga according to dosabhed mention in Sushrut samhita.

Sr. no.	Type of Netra rog	Sankhya
1	Vataj Netra Rog	10
2	Pittaj Netra Roga	10
3	Kaphaj Netra Roga	13
4	Raktaj Netra Roga	16
5	Sarvaj Netra Roga	25
6	Bahyaj Netra Roga	02
Total		76

Acharya Videh has also described 76 types of Netra rog. Acharya Satyaki has described 80 types of Netra rog, Acharya Karal has described 96 types of Netra roga.^[8]

Concept of Vision in Ayurveda

Visual perception, like all other sensory phenomena, is dependent upon the state of mind and soul. Acharya Charaka has described this process as the conjuncture of soul, mind and the

sense organ with the objects. *Kashyapa* classifies senses into *Sannikrishta Indriya* and *Viprakrishta Indriya*. Eyes and ears are the *Viprakrishta Indriya*, wherein object need not directly fall on the senses. Eye has developed sufficient skills to perceive the object from a sufficiently large distance.

The theory of *Panchapanchaka* given by *Acharya Charaka* depicts the phenomenon of sensory perception by enumerating the five important factors that take part in this process. In case of eye, these factors are as follows.

<i>Indriya</i>	-	<i>Chakshu</i> (visual sense)
<i>Indriya Dravya</i>	-	<i>Teja (Jyoti, fire)</i>
<i>Indriya Artha</i>	-	<i>Rupa</i> (appearance)
<i>Indriya Adhishthana</i>	-	<i>Eyes (2 Netra) / Drishti</i>
<i>Indriya Buddhi</i>	-	<i>Chakshurbuddhi</i> (knowledge of vision)

Rupa (Indriya Artha) is travelling in the media of *Jyoti (IndriyaDravya)* towards the eye (*Indriya Adhishthana*). Impulses from both these eyes are collected at *Chakshu (Indriya)*, which is one in number. Further it will be analyzed at the level of *Chakshurbuddhi* (visual knowledge) to give actual knowledge of the objects. As *Dosha* pervade all aspects of physiology, their impacts on these processes are worth-knowing to understand ancient considerations of visual perception. *Vata* is responsible for *Pravartana* (stimulation, activation) of the *Indriya* whereas *Pitta* performs *Alochana* (perception) of the *Indriya Artha*. *Kapha* bestows *Sthairya* (stability) to the *Indriya Adhishthana* by providing *Tarpana*(nutrition). Further, the subtypes of *Doshas* like *Prana Vayu* and *Vyana Vayu* are specifically held responsible for *Vata Karmas*, *Alochaka Pitta* for *Darshana*(visualisation) and *Tarpaka Kapha* for *Akshi Tarpana* (nutrition).^[9]

According to *acharya Bhela*, *Alochaka Pitta* is having two functional components – *Chakshurvaisheshika Alochaka Pitta* and *Buddhirvaisheshika Alochaka Pitta*. The first one acts at the level of retina while the later acts on occipital cortex. The *Buddhirvaisheshika Alochaka Pitta* receives impulses sent by the *Chakshurvaisheshika Alochaka Pitta* and gives determination and confirmation; and this confirmed knowledge is known as *Pratyakshajnana*(true knowledge).^[10] This conduction of visual impulses is carried out by *Prana Vayu*. The momentary knowledge is obtained by *KshanikaChakshurbuddhi*, which will be further confirmed in the second stage by *Nischayatmika Chakshurbuddhi*, according to *Chakrapanidatta*. *Sushruta* relates the theory of common origin (*Tulya yoni*) on the basis of

sensory perceptions. It is believed that light which illuminates the objects and the eye which receives the light, both are derivatives of *Tejo Mahabhoota*, hence eye perceives only Rupa of the objects and not other characters like sound etc.

DISCUSSION

Ayurvedic ophthalmic tradition began much before Sushruta time and references to structure and working of eye, eye diseases and their cure are found in Vedic literature. *Atharvaveda* which is composed by seventh - eighth century BC, contains verses referring to eye diseases. Exact nature of these diseases is not clear and the cures suggested consist both of magical spells and plant preparations. Upanishada form a part of Vedanta texts that were traditionally supposed to be composed in the post-Vedic period and are ascribed a date between 1000 BC to 200 AD. The very first attempt to hypothesize relation between morphological components of the eye and natural and mythological forces expressed in terms of primary elements is seen in the Upanishadic literature. In fact, it is an attempt to explain anatomy and working of the eye.

The most authentic description of eye anatomy is available in sushruta samhita, supposed to be written in B.C.2000 by Acharya sushruta. According to sushruta description of netra sharir is available in uttatantra. So it is needed that there should be a complete and elaborated study of the drishti. There is also a need to form a concept to pin point anatomical structures responsible for the formation of drishti and detailed study of each one of the part of *Netra* with modern comparison is needed.

Acharya Sushruta is only one has emphasized about the scientific method of dissection of Human Cadaver. According to Acharya Sushrut who is the solitary recognized Anatomist & Ophthalmologist of classical period of Ayurveda has very precisely talked of detailed anatomy of "Netra Budbud." He has also described the praman or Ayama & vistar of Netar Budbud and has given the Netra similarity of teats of cow. Sushuta has also talked about *Dristhi pramana*. The formation of eye has been described by sushruta under garbha Bhav. According to Sushruta it has formed by "Atamj Bhava." Eye has been described as *Bahirmukh Srotas* as well as sense organ. The history of disorders of ophthalmology seems to run parallel to the history of medicine. Since the dawn of civilization, human race has undergone a series of evolution to make him free from diseases. This aim along with ultramodern standards of living at present has perhaps leaded the mass to suffer from maximum ophthalmological ailments.

CONCLUSION

Concept of ophthalmology was fully developed and well practiced in ancient *Ayurveda*. *Acharya Kashapya* gives the detailed explanation on anatomical and clinical aspects of ophthalmology such as location, structure of eye, along with its clinical significance. This description is quite similar to modern ophthalmology. *Acharya Vagbhata* has also gives some valuable information about ophthalmology like, development of eye, anatomy of eye, pathogenesis and different disease conditions related to eye. *Acharya Kashyap* has also gives few important thoughts related to ophthalmology. Thus, anatomical information of ophthalmology such as types of eye, structure of eye, pathological conditions and its management through *Ayurveda* all are very valuable information explained in *Ayurvedic* classic which will be understanding kinesiology of eye and while treating various disease conditions of eye.

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