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Review Article

### PHYSIOLOGY OF VISION – A DOSHIC PERSPECTIVE

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#### ABSTRACT

The balance of *Dosha* represents the healthy state and imbalance will cause various diseases. In normalcy *Dosha* will be performing their own functions and individual *Dosha* will be having their own specific sites. By telling the various *Sthana* of each *Dosha*, different function that is taken up by individual *Dosha* in different sites has been highlighted.

Sight or vision is extremely important to human survival. More than half the sensory receptors in the human body are located in the eyes, and a large part of the cerebral cortex is devoted to processing visual information.

The fibrous tunic is the superficial coat of the eyeball and consists of anterior cornea and posterior sclera. The cornea is transparent so as to allow the light to pass and fall over the retina. Sclera, the white of the eye is more rigid and gives shape to the eyeball and protects its inner parts. The vascular tunic consists of three parts, choroid, ciliary body and iris. Retina, inner coat of the eyeball has two layers pigment layer and neural layer. Pigmented layer is located between choroid and neural layer of retina. Neural layer of retina is a multilayered outgrowth of the brain that processes visual data extensively before sending nerve impulses into axons that form optic nerve.

The mechanism of perception of objects in the form of sensory pathways and the various extra ocular muscle movements control by nervous system to the physiological functioning of *Vata Dosha*. The function of retina and its components like rods, cones, rhodopsin etc to the physiological functioning of *Pitta Dosha*. The function of various coats of eye, which provide structural stability to eye and the aqueous humor which also helps in maintaining the shape of the eyeball and nourishing the structures to the physiological functioning of *Kapha Dosha*.

**Keywords:** *Dosha*, Physiology, Eye, Retina, Nayana, Netra.

#### INTRODUCTION

*Dosha, Dathu, Mala* together form the basis of the body<sup>1</sup>. The balance of these entities represents the healthy state and imbalance will cause various diseases<sup>2</sup>. In normalcy, *Dosha* will be performing their own functions and individual *Dosha* will be having their own specific site. By mentioning the various *Sthana* of the each *Dosha* the different function performed by individual *Dosha* in different sites has been emphasised. The sub-types of *Dosha*, its location and function have also been mentioned<sup>3</sup>.

Regarding the *Sthana* of various *Dosha* authors have different opinion. Later authors have added some more *Sthana* of *Dosha*. For example, ears among the location of *Vata*; umbilicus, eyes and skin among the location of *Pitta*; *Kloma*, nose, tongue among the location of *Kapha*<sup>4</sup>.

A brief physiological anatomy of *Netra* is necessary to know the *Doshic* physiology of *Netra*. *Netra Sharira* is explained though vivid description of *Netra* available in all *Samhitha Granthas*, *Shushruta* and *Vagbhata* has - Two terms are available to the organ eye viz. *Nayana* and *Netra*. The former means the eye is like a bubble floating over water i.e. round in shape and soft in consistency, which suggests the external appearance of the eye in the orbit. The later means the eyeball almost round in shape and resembles the cow's teat. In context to the measurement of *Netra*, it is equal to *Swangustodara*, which has been given supported and clearly mentioned by the commentator *Dalhana* that the dimension of this one *Anguli* is equal to the central part of the thumb of an individual. It is stated that, the thickness or antero-posterior diameter of an eyeball is two *Anguli*, and the circumference i.e. horizontal and vertical diameter two and a half *Angulas*. The distance

between two eyes is two *Angulas*. The eye is almost round in shape and resembles the teat of the cow. It is two fingers broad, a thumb's width and two and a half finger in circumference. The distance between the two eyes is two-finger breadth<sup>5</sup>.

An understanding of modern physiological anatomy of eye will be helpful for a better and clear understanding of *Doshic* karmas related to *Netra*. Sight or vision is extremely important to human survival. More than half the sensory receptors in the human body are located in the eyes, and a large part of the cerebral cortex is devoted to processing visual information. Anatomically, the wall of the eyeball consists of three layers Fibrous tunic, vascular tunic and retina<sup>6</sup>.

The fibrous tunic is the superficial coat of the eyeball and consists of anterior cornea and posterior sclera. The cornea is transparent so as to allow the light to pass and fall over the retina. Sclera, the white of the eye is more rigid and gives shape to the eyeball and protects its inner parts<sup>7</sup>. The vascular tunic consists of three parts, choroid, ciliary body and iris. Choroid is the most vascularised part and it lines most of the internal surface of the sclera. It also possesses melanocytes and is brown black in appearance. Ciliary body also has the same appearance as that of the choroid. It has ciliary processes and muscles, which alters the shape of lens, adapting it for near and far vision. The iris, coloured portion of the eyeball suspended between cornea and lens. Retina, inner coat of the eyeball has two layers pigment layer and neural layer. Pigmented layer is located between choroid and neural layer of retina. Neural layer of retina is a multilayered outgrowth of the brain that processes visual data extensively before sending nerve impulses into axons that form optic nerve<sup>8</sup>.

#### Physiology of *Vata* in eye

Stimulation of sense organs and conveying all the sensory and motor stimuli to the concerned organs is considered as the function of *Vata*. Along with this during the formation of body parts in fetal life *Vata* is having the function of formation and development of body parts including the eye<sup>9</sup>. Among the five types of *Vata*; *PranaVata* is having the regulatory function of *Indriya* and *VyanaVata* is having the function of blinking of eyelids<sup>10</sup>.

Considering points from contemporary science- Visual signals in the retina undergo considerable processing at synapses among the various types of neurons in the retina (horizontal cells, bipolar cells, and amacrine cells. Then, the axons of retinal ganglion cells provide output from the retina to the brain, exiting the eyeball as the optic (II) nerve.

- Light → photoreceptors → bipolar cells → ganglion cells
- Axons of ganglion cells exit eye as the optic nerve → optic chiasma (85% cross) → optic tracts → lateral geniculate nucleus (thalamus) → optic radiation → primary visual cortex (area 17 → 18, 19)

Pair of eyelids protects the eyeball from direct exposure to sunlight and protects from dust etc. By constant blinking it helps the lacrimal secretion to spread throughout the conjunctiva and keep it moist. Internal to this there are extra ocular muscles which helps in the movement of eyeball to the concerned direction<sup>11</sup>.

Considering these aspects we can relate the mechanism of perception of objects in the form of sensory pathways and the

various extra ocular muscle movements control by nervous system to the physiological functioning of *VataDosh*.

#### Physiology of *Pitta* in eye

*Darshana* is considered as the one of the important function of *Pitta Dosh*.<sup>12</sup> among the five types of *Pitta*, *Alochaka Pitta* is the one which is located in *Chaksu*<sup>13</sup>. It captures the image of external object and helps in recollection about image.

Considering points from contemporary science- Retina, inner coat of the eyeball has two layers pigment layer and neural layer. Pigmented layer is located between choroid and neural layer of retina. Neural layer of retina is a multilayered outgrowth of the brain that processes visual data extensively before sending nerve impulses into axons that form optic nerve. The inner layer of the eyeball is the retina. It consists of two parts. Posteriorly and laterally is the optic part of the retina, which is sensitive to light, and anteriorly is the nonvisual part. The optic part of the retina consists of two layers. An outer pigmented layer and an inner neural layer. Pigmented layer absorbs light, carries out phagocytosis, stores vitamin A. Neural layer contains photoreceptors (rods and cones) for visual perception, contains bipolar cells & ganglion cells for visual impulse transmission<sup>14</sup>.

Considering these aspects we can relate function of retina and its components like rods, cones, rhodopsin etc to the physiological functioning of *PittaDosh*

#### Physiology of *kapha* in eye

Providing strength is the important function of *Kapha Dosh*<sup>15</sup>. Along with this nourishing various body parts is also considered as the important function of *KaphaDosh*<sup>16</sup>. Among the five types of *Kapha*, *TarpakaKapha* is having the function of Nourishment of sense organs including the eye<sup>17</sup>.

Considering points from contemporary science-The adult eyeball measures about 2.5cm in diameter. Of its total surface area, only the anterior one-sixth is exposed; the remainder is recessed and protected by the orbit, into which it fits. Anatomically, the wall of the eyeball consists of three layers Fibrous tunic, vascular tunic and retina. The fibrous tunic is the superficial coat of the eyeball and consists of anterior cornea and posterior sclera. The cornea is transparent so as to allow the light to pass and fall over the retina. Sclera, the white of the eye is more rigid and gives shape to the eyeball and protects its inner parts<sup>18</sup>.

The anterior cavity—the space anterior to the lens—consists of two chambers. The anterior chamber lies between the cornea and the iris. The posterior chamber lies behind the iris and in front of the zonular fibers and lens. Both chambers of the anterior cavity are filled with aqueous humor, a transparent watery fluid that nourishes the lens and cornea. Aqueous humor continually filters out of blood capillaries in the ciliary processes of the ciliary body and enters the posterior chamber. It then flows forward between the iris and the lens, through the pupil, and into the anterior chamber. From the anterior chamber, aqueous humor drains into the scleral venous sinus (canal of Schlemm) and then into the blood. Normally, aqueous humor is completely replaced about every 90 minutes. It helps in maintaining the intraocular pressure and also assists in maintaining the shape of the eyeball and hence proper vision<sup>19</sup>.

Cerebrospinal fluid (CSF) is a clear, colorless liquid that protects the brain and spinal cord from chemical and physical injuries. It also carries oxygen, glucose, and other needed chemicals from the blood to neurons and neuroglia<sup>20</sup>.

Considering this aspects we can relate the function of various coats of eye, which provide structural stability to eye and the aqueous humor which also helps in maintaining the shape of the eyeball and nourishing the structures to the physiological functioning of *KaphaDosh*.

## CONCLUSION

The *Doshas* are present throughout the body and in normalcy they perform their normal physiological function.

With respect to eye the neurological functions like sensory functions and function of movement of eyeball are done by *VataDosh* very specifically *Prana*, *Vyanavata* respectively.

Capturing the image of external object and helping in recollection about image are function of retina and its components like rods, cones, rhodopsin etc can be related to the physiological functioning of *Pitta Dosh* very specifically *Alochakapitta*.

Function aqueous humor, CSF providing nourishment and layers of eye giving stability and shape to eyeball can be related to the function of *Kapha* and specifically *TarpakaKapha* which is responsible for the nourishment of all the 5 *Indriya* including *Netra*.

So all the three *Dosha* perform the various physiological functions in relation to eye. There is the need for further study and research regarding the *Sthana* of all three *Dosha* in different structures/organs in the body and its physiology.

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