

## REVIEW ARTICLE

# *Patala* the Layers of Eye-Basis of all Eye Disorders in *Ayurveda* a Critical Review

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### ABSTRACT

**Introduction:** *Ayurveda* is a science that is discovery-oriented and explores fundamental theory as scientific facts. With time these facts have been illustrated by the founding fathers of *Ayurveda*. Ayurvedic dogma has elucidated *Netra Rachna Sharir* and *Kriya Sharir* in a beautiful descriptive manner; still, there is a need of exploring the terminologies for proper understanding of the pathogenesis of *Netra Rogas* and their management so that implementation of *Ayurvedic* concepts in eye disease can be done.

**Materials and Methods:** The correlation of the term *Patala* with the various entities of the eyeball has been done in-depth analysis of various Sanskrita and English dictionaries, classical texts of *Ayurveda* along with commentary as well as texts from modern science.

**Results:** In this literary research paper, we have tried to establish an alliance of *Netra Patalas* according to their anatomical position in eye and pathology.

**Conclusions:** A thorough description of the anatomy of the eye, with the *patala* being the majority of the structure, is essential to treating and comprehending such problems in *Ayurveda*.

## 1. INTRODUCTION

Appreciating the etiopathogenesis of disorders is more or less dependent on the area affected and the treatment of the diseases also depends on the site of the infection within the eye. There is a broad spectrum of eye pathology including dystrophies, degenerations, vascular diseases, congenital abnormalities, toxicities, inflammatory diseases, neoplasms, detachments, trauma, and involvement of systemic diseases affecting different layers of eyeball. In *Ayurveda*, treatment of any disorder depends on many factors in which the site of pathogenesis is one of the important factors. To understand the *Samprapti* of eye disorders, understanding the layers of eyes or the

*Patala* is very important as this is the *ashraya* of *vyadhis* occurring in the eye. In the leading text of *Ayurveda* ophthalmology, there are six layers of eye called *Patala*<sup>[1]</sup> each one of these layers having a predominant *dosha* based on its embryological development.<sup>[1]</sup> A spectrum of disorders developing from these layers and their prognosis depends on the involvement of a specific layer or *Patala*.<sup>[2]</sup> From anatomical perspective, eyeball basically contains three layers outer, middle, and inner layers including the external structure of the eye such as eyelids, muscles, and accessory glands. Further outer the fibrous layer of the eye made up of cornea which is having six layers,<sup>[3]</sup> sclera three layers.<sup>[4]</sup> Middle vascular layer containing three parts of tissue<sup>[5]</sup> and the internal nervous layer containing 10 layers.<sup>[6]</sup> In *Ayurveda* also eye has two *Vartma patala* and four *Patala* pertaining to eyeball and various disorders occurring in those layers. To address and understand those disorders, a detailed explanation of *Ayurveda* anatomy of the eye is important and the *Patala* being the major part of the anatomy.

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## 2. ANATOMY OF PATALA

*Patala* consists of *PAT* + *KLACH PRATYA* which means layer, veil, covering, or membrane. Six coats (*patala*) are differentiated as two external structures and four inside the eyeball.<sup>[7]</sup> The external two coats are the upper eyelid (orbital palate) and lower eyelid (tarsal palate). This is called *varitamapatala* while the four *patala* inside the eyeball are; first internal *patala* is *tejo jala ashrita* (aqueous humor and tears), second *patala* is *mamsa ashrita* (uveal tract), third is *meda ashrita* (vitreous) and fourth is *asthi ashrita*.<sup>[1]</sup> *Acharya Dalhana* has different opinion for the sequence of *Patalas* that are inside the eyeball counting from inside to outside as: First *patala* to be *Asthi Ashrita*, *dwitiya patala* to be *meda Ashrita*, *Tritiya patala* to be *Mamsa Ashrita* and *Chaturtha patala* to be *tejo-jala Ashrita*.

First *patala* is comprised with *teja* and *jala mahabhoot*. *Acharya dalhana* described *teja* as *siragata pitta*. This can be taken as the cornea, sclera, tear film, and aqueous humor in the modern aspect. The anterior part of eye is transparent (the cornea) and the remaining is opaque (the sclera). The sclera is the tough white colored opaque outer covering of the eyeball. It is pierced by the anterior ciliary arteries and episcleral veins anteriorly and the vortex veins, posterior ciliary nerve, and vessels.<sup>[8]</sup> That explain that it is *tejoashritha* and that's why choroid is extremely vascular membrane in contact everywhere with the sclera, although not firmly adherent to it.<sup>[9]</sup> According to this, *Episcleritis* can be consider into *pratham patalgaat roga*.

The clinical feature of *pratham patala* is blurred vision (*avyakt darshan*) that may be caused by refractive error which may be corrected by accommodation. As we know refractive myopia and curvature myopia occur due to a change in refractive index of the cornea and a change in curvature of the cornea which leads to blurring of vision.<sup>[10]</sup> In dry eye, lack of tear production may lead to episodes of blurred vision. Watering in case of lacrimation can be correlated to this. Aqueous humor is the watery fluid, similar to cerebrospinal fluid called as *tejojala*. Anterior chamber is a space filled with fluid the aqueous humor, it is bound in front by the cornea and behind by iris (that is included in *dwitiya patala*) and the part of the anterior surface of lens (included in *tritiya patala*) which is exposed in the pupil.

As we know that first *patala* is *jalashritha* and so with that we can explain the transparency of cornea. The transparency of cornea is related to the stromal component. A descemments membrane is a thin elastic membrane covered on its posterior surface by endothelium. The primary mechanism controlling stromal hydration is the function of the corneal endothelium. Electrolyte is removed and water flow passively. The cornea is very richly supplied with nerve fiber derived from the trigeminal nerve. It has no blood vessels with the exception of minute arcades, extending about 1mm into the cornea at the limbus so that it is dependent for its nourishment upon diffusion of tissue fluid from vessels at its periphery and the aqueous humor.<sup>[11]</sup>

Second *patala* is constituted with *mamsa* that can be taken with ciliary zonules, uveal tract, and lens attachment. As we know lining the inner aspect of the sclera are two structure-one of them is highly vascular uveal tract concerned chiefly with the nutrition of the eye.<sup>[11]</sup>

Due to defects in second *patala* patient sees objects such as insects, hairs, and webs, and sees certain luminous objects like stars. Objects which are near appear to be far and vice versa, unable to thread a needle.<sup>[12]</sup> *Mamsdhatu* has *sandhankaran*<sup>[13]</sup> property which helps in position of lens. Hence, subluxation of the lens and dislocation of lens can be taken under second *patalagat roga*. It also gives nourishment to the inner structure of eye. Uveal tissue constitutes the middle vascular coat of the eyeball. From

anterior to posterior, it can be divided into three parts, namely, iris, ciliary body, and choroid. Iris is the anterior part of the uveal tract which is thin circular disc corresponding to the diaphragm of a camera. In its center is an aperture of about 4-mm diameter called pupil which regulates the amount of light reaching the retina.<sup>[14]</sup> Hence, choroid detachment, iridocyclitis, cyclitis and ciliary muscle paralysis, spasm of accommodation can be considered under second *patalgata roga*. *Seclusio pupillae* and *occlusio pupillae* in which *synechiae* occur can also consider in second *patala dosha*.

## 3. CLINICAL FEATURES OF 3<sup>RD</sup> PATALA TIMIRA

Third *patala* constitutes of *medha dhatu* which can be equated with vitreous and lens. The vitreous humor is an inert, transparent, jelly-like structure that fills the posterior four-fifths of the cavity of the eyeball and is about 4ml in volume. It is a hydrophilic gel that mainly serves optical functions. In addition, it mechanically stabilizes the volume of the globe and is pathway for nutrient to reach the lens and retina.<sup>[15]</sup> The lens is a transparent, biconvex, crystalline structure placed between iris and the vitreous in a saucer-shaped depression called as *patellar fossa*.<sup>[16]</sup> Vitreous opacity such as *Muscae volitantes*, *PVD* with vitreous liquefaction (*synchysis*) and collapse (*syneresis*), *synchysis scintillans* (in which vitreous is laden with the crystalline bodies formed of cholesterol), *asteroid hyolosis* (in which calcium containing lipid bodies suspended in vitreous gel), *amyloid degeneration* and *cataract* can be considered under this category. The cortical lens can be compared with *medha dhatu* and which is viscous lipoproteinaceous and white in color.

Floater and Scotomas or blind spot are as in visual field giving rise to field defects. If the *Dosha* is situated in the side of *Drishhti* then lateral part of field of vision is lost (*pashrvasthi tatha doshe pashrvasthani na pashyati*).<sup>[17]</sup> Patients with central opacities (e.g., *cupulifrom cataract* i.e., posterior subcapsular cataract) have early loss of vision. These patients see better when pupil is dilated due to dim light in the evening (day blindness). In patients with peripheral (e.g., *cuneiform cataract*), visual loss is delayed and vision improves in bright light when pupil is contracted.<sup>[18]</sup> Gradually diminished of vision, detailing of objects are not visible, unable to perceive certain parts in a face, *diplopia*, *micropsia*, *metamorphopsia*, etc. *Raga prapthi* to the *patalas* such as any change in the general background.<sup>[19]</sup> Example: Vitreous hemorrhage-as *pittaja*, *Retinitis pigmentosa* as *vataja*.

There will be *raga prapthi*-different colors will be imparted to the *patalas* corresponding to the *dosha* involved.<sup>[20]</sup>

*Vatadosha*-reddish black, cloudy moving object, *pitta*-yellow or blue rainbow spectrum, glow-worm, flash of lightning, features of peacock, *kapha*-white cloudy like, *rakta*-red or enveloped in groom, *sannipataja* as multiple colors and *parimlayi* as yellow, red or blue, sight as if resplendent with the light of the rising sun, and trees seem as if sparkling with the tangles of fire-flies.<sup>[21]</sup>

Fourth *patala* that is *asthi ashrith*.<sup>[1]</sup> Retina is the innermost tunic of the eyeball, and is a thin, delicate, and transparent membrane. Optic disk is pink colored, well defines circular area of 1.5-mm diameter. At the optic disk, all the retinal layers terminate except the nerve fibers, which pass through the lamina cribrosa to run into optic nerve.<sup>[22]</sup> Hence, retina, optic disk, and periosteum of the orbit can be correlated to it. A nervous layer, the true visual nerve ending concerned with the reception and transformation of light stimuli called retina.

Clinical features of fourth *patala Timira*

- a. Loss of vision-*lingnasha* stage.
- b. *Drishhti mandala* (pupil) is covered by vitiated *doshas*.
- c. Perception of bright light only present.<sup>[23]</sup>

Cortical part of the lens is the supporting structure. In the case of complete opacification of lens fiber that is in mature cataract, there is a complete loss of vision that can be called *lingnasa*. Hyper mature cataract, optic atrophy, central retinal artery occlusion, retinal traction, retinoblastoma, hypoplasia of optic disc can be considered under this category.

#### 4. DISEASES RELATED TO DIFFERENT PATALA

Episcleritis, refractive error, and dry eye, can be considered under *pratham patalgat roga*. Iridocyclitis, cyclitis, and ciliary muscle paralysis, spasm of accommodation, and Choroid detachment can be considered under second *patalgat roga*. Seclusio pupillae and oclusio pupillae in which synechiae occur can also consider in second *patala dosha*. Vitreous opacity such as Muscae volitantes, PVD with vitreous liquefaction (synchysis) and collapse (syneresis), synchysis scintillans (In which vitreous is laden with the crystalline bodies formed of cholesterol), asteroid hylosis (in which calcium containing lipid bodies suspended in vitreous gel), amyloid degeneration, vitreous hemorrhage, and cataract can be considered under this category.

Hyper mature cataracts, optic atrophy, central retinal artery occlusion, retinal traction, retinoblastoma, and hypoplasia of optic disk can be considered under *chaturtha patalgat vyadhi*.

#### 5. DISCUSSION

*Patala* can be correlated with the layers of eye. *Pratham patala* can be correlated with the cornea, sclera, tear film, aqueous humor, and tear film. *Dwitiya patala* can be correlated with the ciliary zonules, uveal tract, and lens. *Tritiya patala* can be correlated with the vitreous and lens. *Chaturtha patala* can be correlated with the retina, optic disc, and periosteum.

#### 6. CONCLUSIONS

In *Ayurveda*, many diseases have been explained on the basis of *patala*. By advancement in modern technology, many anatomical structures of the eye, pathology, and their management have been deciphered. An elaborate interpretation of eye anatomy and pathology through the spectrum of *patala* has been explained in this article.

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S. No.	<i>Patala</i>	<i>Ashraya</i>	Anatomical structure	Diseases
1.	<i>Pratham</i>	<i>Tejojalashritha</i>	Cornea, sclera, tear film, aqueous humor	Episcleritis, refractive error, dry eye
2.	<i>Dwitiya patala</i>	<i>Mamsa ashkritha</i>	ciliary zonules, uveal tract, and lens	choroid detachment, iridocyclitis, cyclitis, and ciliary muscle paralysis, spasm of accommodation, Seclusio-pupillae and occlusion-pupillae
3.	<i>Tritiya patala</i>	<i>Medo ashkritha</i>	Vitreous and lens	Vitreous opacity such as Muscae volitantes, PVD with vitreous liquefaction (synchysis) and collapse (syneresis), synchysis scintillans (in which vitreous is laden with the crystalline bodies formed of cholesterol), asteroid hylosis (in which calcium containing lipid bodies suspended in vitreous gel), amyloid degeneration, vitreous hemorrhage, and cataract
4.	<i>Chaturta patala</i>	<i>Asthiashkritha</i>	Retina, Optic disc, periosteum	Hypermaturation cataract, optic atrophy, central retinal artery occlusion, retinal traction, hypoplasia of optic disk retinoblastoma.