



Anatomical Considerations Of Various Tunics Of The Eyeball WSR To Netra Patala

Dr. Kavita Singh¹, Dr. Ajitkumar S. Wahane^{2*}, Dr. Dhara F.Patel³

¹P.G. Scholar, Department Of Rachana Shareera, Parul Institute Of Ayurveda, Parul University, Limda, Vadodara, Gujarat – 391760.

^{2*} Associate Professor, Department Of Rachana Shareera, Parul Institute Of Ayurveda, Parul University, Limda, Vadodara, Gujarat – 391760.

³P.G. Scholar, Department Of Rachana Shareera, Parul Institute Of Ayurveda, Parul University, Limda, Vadodara, Gujarat – 391760, drdhara97@gmail.com, Mob.7016564118.

***Corresponding Author :** Dr. Ajitkumar S. Wahane

*Associate Professor, Department Of Rachana Shareera, Parul Institute Of Ayurveda, Parul University, Limda, Vadodara, Gujarat – 391760, Email Id: ajitkumar.wahane@paruluniversity.ac.in Contact no. 8975401349

Abstract

Ayurveda is a science that is discovery oriented and explore fundamental theory as scientific facts. With time these facts have been illustrated by the founding fathers of *Ayurveda*. Ayurvedic dogma have elucidated *Netra Rachana Shareera* and *Kriya Shareera* in a beautiful descriptive manner, still there is need of exploring the terminologies for proper understanding of pathogenesis of *Netra rogas* and their managements so that implementation of Ayurvedic concepts in eye diseases can be done. Acharya Sushruta elucidated the *Netra Shareera* into three distinct parts called as *Mandala*, *Sandhi*, and *Patala*. In this review, we have tried to establish alliance of *Netra Patala* according to their anatomical position in eye and pathology.

Keywords: Tunics of eyeball, Cornea, *Patala*, *Krishnamandala*, *Drishtimandala* Ayurveda

INTRODUCTION:

Appreciating the etiopathogenesis of disorders and their treatment is dependent 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 eye ball. In order to understand the *Samprapti* of the eye disorders, understanding the layers of eyes or the *Patala* are very important as this is these are the sites of many diseases occurring in the eyes. In Ayurveda, there are 6 layers of related to eye called *Patala* each one of these layers having a predominant *Dosha* based on its embryological development.¹ A spectrum of disorders developing from these layers and their prognosis depends on the involvement of specific layer or *Patala*.² From anatomical perspective eyeball basically contains 3 layers outer, middle and inner layer including external structure of eye like eyelids, muscles, accessory glands. Further outer fibrous layers of eye made up of cornea which is having 6 layers, sclera 3 layers.³ Middle vascular layer containing 3 parts of tissue and the internal nervous layer containing 10 layers.⁴ In Ayurveda also eye has 2 *Vartma patala* and 4 *Patala* pertaining to eyeball and various disorders occurring in those layers. To address and understand those disorders detailed explanation of Ayurveda anatomy of eye is important and the *Patala* being the major part of the anatomy.

RESULT

The etymology of *Patala* consists of PAT + KLACH PRATYA which means layer, veil, covering or membrane.⁵ Six coats (*Patala*) are differentiated as two external structures and four inside the eyeball.⁶ The external two coats are the upper eyelid (orbital palate) and lower eyelid (tarsal palate). These are called *Vartma patala* while the four *Patala* inside the eyeball are; 1st 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*.⁷ 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*.⁸

DISCUSSION

First patala comprises with *teja* and *jala mahabhuta*. *Acharya dalhana* described *Teja* as *Siragata pitta*. This can be taken as cornea, sclera, tear film and aqueous humour in modern aspect. As 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.⁹ This shows that it is *Tejo-jala-ashrita* and that's why choroid is extremely vascular membrane in contact

everywhere with the sclera, although not firmly adherent to it. According to this Episcleritis can be consider into *pratham patalgata roga*.¹⁰

The clinical feature of *Pratham Patala* is *Avyakta darshana* (blurred vision) that may be caused by refractive error which may be corrected by accommodation. As refractive myopia and curvature myopia occur due to change in refractive index of the cornea and change in curvature of the cornea which leads to blurring of vision.¹¹ In dry eye lack of tear production may also lead to episodes of blurred vision. Aqueous humor is the watery fluid, like cerebrospinal fluid called as *Tejojala*. Anterior chamber is a space filled with fluid the aqueous humour, it is bound in front by 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.

Transparency of cornea is related to the stromal component. Descemet's membrane is a thin elastic membrane covered on its posterior surface by endothelium. The primary mechanism controlling stromal hydration is the function of corneal endothelium. Electrolyte are removed and water flow passively. The cornea is very richly supplied with nerve fiber derived from trigeminal nerve. It has no blood vessels with 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.¹²

Second Patala constitutes with *Mamsa* that can be taken with ciliary zonules, uveal tract and lens attachment. As we know that 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.¹³

Due to defects in second *Patala* patient sees objects like insects, hairs and webs, and sees certain luminous objects like stars. Patient finds difficulty to thread a needle. Objects which are near appears to be far and vice versa.¹⁴ *Mamsdhatu* has *Sandhana karana*¹⁵ property which helps in positioning of the lens in the patellar fossa. So, subluxation of lens and dislocation of lens can be taken under second *Patalagata roga*. It also gives nourishment to 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 regulate the amount of light reaching the retina.¹⁶ So, choroid detachment, iridocyclitis, cyclitis and ciliary muscle paralysis, spasm of accommodation can be considered under second *Patalgata roga*. Seclusio pupillae and oclusio pupillae in which synechiae occur can also be considered in second *Patalagata dosha*.

Third Patala which constitutes of *Medha dhatu* that can be equated with vitreous and lens. The vitreous humor is an inert, transparent, jelly like structure that fills the posterior four-fifth of the cavity of eyeball and is about 4mL in volume. It is a hydrophilic gel that mainly serve optical functions. In addition, it mechanically stabilizes the volume of globe and is pathway for nutrient to reach the lens and retina.¹⁷ The lens is a transparent, biconvex, crystalline structure placed between iris and the vitreous in a saucer shaped depression called as patellar fossa. Vitreous opacity such as muscae volitantes, posterior vitreous detachment 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 and cataract can be considered under this category. The cortical lens can be compared with *Medha dhatu* and that is viscous lipo-proteinaceous and white in colour.

Floater and Scotomas or blind spot in visual field are as giving rise to field defects. If the *Dosha* are situated in the side of *Drishti* then lateral part of field of vision is lost.¹⁸ Patient with central opacities in lens (e.g., cupuliform 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 the patients with peripheral (e.g., cuneiform cataract) visual loss is delayed and vision improves in bright light when pupil is contracted.¹⁹ Gradually diminished of vision, detailing of objects are not visible, unable to perceive certain parts in a face, diplopia, micropsia, metamorphopsia etc., *Raga Prapti* to the *Patalas* such as any change in the general back ground.²⁰ Example: vitreous hemorrhage – as *Pittaja*, retinitis pigmentosa as *Vataja*. There will be *raga Prapti* - different colours will be imparted to the *Patalas* corresponding to the *Dosha* involved.²¹ *Vatadosha* – reddish black, cloudy moving object, *pitta* –yellow or blue rainbow spectrum, glow worm, flash of lightening, features of peacock, *kapha* – white cloudy like, *rakta* –red or enveloped in groom, *sannipataja* as multiple colours 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.²²

Fourth patala that is *asthi ashrih*²³. Retina is the innermost tunic of the eyeball, is a thin, delicate and transparent membrane. Optic disc is pink colored, well defines circular area of 1.5mm diameter. At the optic disc all the retinal layers terminate except the nerve fibres, which pass through the lamina cribrosa to run into optic nerve.²⁴ So retina, optic disc and periosteum of the orbit can be correlate 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) *Drishti mandala* (pupil) is covered by vitiated *doshas*.
- c) Perception of bright light only present²⁵.

Cortical part of the lens is supporting structure. In case of complete opacification of lens fiber that is in mature cataract there is 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.

Diseases related to different Patala:

Episcleritis, refractive error, dry eye, can be considered under pratham patalgat roga. Iridocyclitis, cyclitis and ciliary muscle paralysis, spasm of accommodation, 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 cataract, optic atrophy, central retinal artery occlusion, retinal traction, retinoblastoma, hypoplasia of optic disc can be considered under chaturtha patalgata vyadhi.

S.No.	Patala	Ashraya	Anatomical structure	Diseases
1.	Pratham	Tejojal ashrita	Cornea, sclera, tear film, aqueous humour.	Episcleritis, refractive error, dry eye.
2.	Dwitiya patala	Mamsa ashrita	Ciliary zonules, uveal tract and lens	choroid detachment, iridocyclitis, cyclitis and ciliary muscle paralysis, spasm of accommodation, Seclusio-pupillae and occlusion-pupillae.
3.	Tritiya patala	Medo ashrita	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 haemorrhage, and cataract.
4.	Chaturth patala	Asthi ashrita	Retina, Optic disc, periosteum	Hyper mature cataract, optic atrophy, central retinal artery occlusion, retinal traction, hypoplasia of optic disc retinoblastoma.

CONCLUSION

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

REFERENCE

- Shastri A.D. Sushruta, Sushruta Samhita edited with Ayurveda Tatva Sandipika commentary, Chaukhambha Sanskrita Sansthan, Varanasi, Volume 2, reprint 2016, Uttara Tantra Chapter 1 Verse 14
- Shastri A.D. Sushruta, Sushruta Samhita edited with Ayurveda Tatva Sandipika commentary, Chaukhambha Sanskrita Sansthan, Varanasi, Volume 2, reprint 2016, Uttara Tantra Chapter 1 Verse 17
- Sridhar MS. Anatomy of cornea and ocular surface. *Indian J Ophthalmol.* 2018;66(2):190-194. doi:10.4103/ijo.IJO646_17
- Reekie Ian R., Sharma Srilakshmi, Foers Andrew, Sherlock Jonathan, Coles Mark C., Dick Andrew D., Denniston Alastair K., Buckley Christopher D. The Cellular Composition of the Uveal Immune Environment, *Frontiers in Medicine.* VOL. 8. 2021. DOI:10.3389/fmed.2021.721953
- Manaka Hindi kosha and Sir. M.M. William's Sanskrit dictionary.
- Shastri A.D. Sushruta, Sushruta Samhita edited with Ayurveda Tatva Sandipika commentary, Chaukhambha Sanskrita Sansthan, Varanasi, Volume 2, reprint 2016, Uttara Tantra Chapter 1 Verse 17.
- Nibandha Sangraha Commentry of Shri Dalhanacharya and Nyayachandrika Panjika of Shri Gayadasacharya on Nidanasthana, edited by Vaidya Yadavji Trikamji and Narayam Ram Achrya 'Kavyatirtha' Chaukhambha Subharti Prakashan, Varanasi; Edition: Reprint, 2008.

- 8 Nibandha Sangraha Commentry of Shri Dalhanacharya and Nyayachandrika Panjika of Shri Gayadasacharya on Nidanasthana, edited by Vaidya Yadavji Trikamji and Narayam Ram Achrya 'Kavyatirtha' Chaukhambha Subharti Prakashan, Varanasi; Edition: Reprint, 2008. Uttara Tantra Chapter 1 Verse 17.
- 9 Miller PE. Uvea. *Slatter's Fundamentals of Veterinary Ophthalmology*. 2008;203-229. doi:10.1016/B978-072160561-6.50014-9
- 10 Mansi et al. Conceptual Study on Shuklagata Roga involving Sira with special reference to Episcleritis and Scleritis. *Int J Ayu Pharm Chem* 2019 Vol. 11 Issue 3. 175-185.
- 11 Shastri A.D. Sushruta, Sushruta Samhita edited with Ayurveda Tatva Sandipika commentary, Chaukhambha Sanskrita Sansthan, Varanasi, Volume 2, reprint 2016, Uttara Tantra Chapter 7 Verse 6-7.
- 12 Goel M, Picciani RG, Lee RK, Bhattacharya SK. Aqueous humor dynamics: a review. *Open Ophthalmol J*. 2010;4:52-59. Published 2010 Sep 3. doi:10.2174/1874364101004010052
- 13 Pellegrini M, Senni C, Bernabei F, et al. The Role of Nutrition and Nutritional Supplements in Ocular Surface Diseases. *Nutrients*. 2020;12(4):952. Published 2020 Mar 30. doi:10.3390/nu12040952
- 14 Shastri A.D. Sushruta, Sushruta Samhita edited with Ayurveda Tatva Sandipika commentary, Chaukhambha Sanskrita Sansthan, Varanasi, Volume 2, reprint 2016, Uttara Tantra Chapter 7 Verse 9-10.
- 15 Nibandha Sangraha Commentry of Shri Dalhanacharya and Nyayachandrika Panjika of Shri Gayadasacharya on Nidanasthana, edited by Vaidya Yadavji Trikamji and Narayam Ram Achrya 'Kavyatirtha' Chaukhambha Subharti Prakashan, Varanasi; Edition: Reprint, 2008. Uttara Tantra Chapter 1 Verse 18.
- 16 Mehar, K., Tripathi, A. ., Bavalatti, N. ., & Rajagopala, . M. . (2023). Understanding Drishti in the lights of Netra Sharir and various Ocular disorders - A Review: DOI: <https://doi.org/10.47223/IRJAY.2023.6117>. *International Research Journal of Ayurveda & Yoga*, 6(1), 97–102. <https://doi.org/10.47223/IRJAY.2023.6117>
- 17 Olympia Sideri, Konstantinos T. Tsaousis, He J. Li, Maria Viskadouraki, Ioannis T. Tsinopoulos, The potential role of nutrition on lens pathology: a systematic review and meta-analysis, *Survey of Ophthalmology*, Volume 64, Issue 5, 2019, Pages 668- 678. <https://doi.org/10.1016/j.survophthal.2019.03.003>.
- 18 Shastri A.D. Sushruta, Sushruta Samhita edited with Ayurveda Tatva Sandipika commentary, Chaukhambha Sanskrita Sansthan, Varanasi, Volume 2, reprint 2016, Uttara Tantra Chapter 7 Verse 13-15.
- 19 Ophthal .pg 189
- 20 Shastri A.D. Sushruta, Sushruta Samhita edited with Ayurveda Tatva Sandipika commentary, Chaukhambha Sanskrita Sansthan, Varanasi, Volume 2, reprint 2016, Uttara Tantra Chapter 7 Verse 12.
- 21 Shastri A.D. Sushruta, Sushruta Samhita edited with Ayurveda Tatva Sandipika commentary, Chaukhambha Sanskrita Sansthan, Varanasi, Volume 2, reprint 2016, Uttara Tantra Chapter 7 Verse 30.
- 22 Shastri A.D. Sushruta, Sushruta Samhita edited with Ayurveda Tatva Sandipika commentary, Chaukhambha Sanskrita Sansthan, Varanasi, Volume 2, reprint 2016, Uttara Tantra Chapter 7 Verse 19-25.
- 23 Nibandha Sangraha Commentry of Shri Dalhanacharya and Nyayachandrika Panjika of Shri Gayadasacharya on Nidanasthana, edited by Vaidya Yadavji Trikamji and Narayam Ram Achrya 'Kavyatirtha' Chaukhambha Subharti Prakashan, Varanasi; Edition: Reprint, 2008. Sutra Sthana Chapter 15 Verse 7.
- 24 Mehar, K., Tripathi, A. ., Bavalatti, N. ., & Rajagopala, . M. . (2023). Understanding Drishti in the lights of Netra Sharir and various Ocular disorders - A Review: DOI: <https://doi.org/10.47223/IRJAY.2023.6117>. *International Research Journal of Ayurveda & Yoga*, 6(1), 97–102. <https://doi.org/10.47223/IRJAY.2023.6117>
- 25 Nibandha Sangraha Commentry of Shri Dalhanacharya and Nyayachandrika Panjika of Shri Gayadasacharya on Nidanasthana , edited by Vaidya Yadavji Trikamji and Narayam Ram Achrya 'Kavyatirtha' Chaukhambha Subharti Prakashan, Varanasi; Edition: Reprint, 2008. Uttara Tantra Chapter 7 Verse 15-17.