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## Review Article

### SCIENTIFIC ASPECTS OF SUSHRUTA'S NETRA SHARIR IN CONTEXT TO MODERN OPHTHALMIC ANATOMY

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#### ABSTRACT

The Sushruta Samhita is remarkable in concern with surgery hence Acharya Sushruta is known as Father of surgery. Among five sections of Sushruta Samhita, SharirSthana deals with anatomical aspects whereas Uttartantra deals with surgery and applied anatomy. The task of tracing back the history of anatomy of eye has been very difficult, as early history of it is quite obscure. In first chapter of Uttartantra Sushruta described gross anatomy and applied anatomy of eye. Apart from this, references regarding anatomy of eye are scattered in all sections of Sushruta Samhita. In this present study we have collected all the references regarding anatomy of eye from Sushruta Samhita and contemporary authors. The logical correlation of terms and concepts from these references with modern ophthalmic anatomy has also derived. It is beneficial for crystal clear understanding of anatomy of eye.

**Keywords:** Netra Sharira, Akshi Sharir, Anatomy of Eye, Sushruta Samhita

#### INTRODUCTION

In the era of evidence based medicine it is the need of an hour to learn ancient knowledge of Ayurveda in an organized manner. We, along with disciplines of modern medicine consider Acharya Sushruta as Father of surgery. He has described not only surgeries but also designed instruments to perform them. In the history of medicine, he is the first who performed dissection on human body. We are well versed with the fact that Sushruta is pioneer in the field of ophthalmic surgery. It is not possible for anybody to perform these surgeries without proper knowledge of relevant anatomy. Sushurata also knew ocular anatomy, physiology, pathology and therapeutics of the eye. He has described 76 varieties of ocular diseases and fiftyone out of them were surgical. <sup>1</sup> He also performed cataract surgery followed by lens extraction.<sup>2</sup>

As the knowledge of that era was not in the scripted format, we get scattered references of ophthalmic anatomy in Sushruta Samhita and other contemporary texts. It is need of an hour to study these references and reorganize this knowledge in a more scientific manner for better understanding.

Through this study it is our sincere effort to collect all ophthalmology related anatomical terms and find out the scientific meaning of those terms through evidences present in ancient Ayurvedic texts and in their commentaries by different authors.

Detail study of Sushruta Samhita and its commentaries by various authors has been performed and all the references regarding Netra were collected. Terms revealing Netra Sharir were compiled to derive its scientific meaning. The references from modern ophthalmology were also utilized to correlate these concepts and terms.

#### LITERATURE REVIEW

After going through different references of Akshi-sharir in Ayurvedic Samhitas and their commentaries we come to know a very interesting fact that, ancient sages were well versed with minute facts about Akshi-Sharir. If we consider availability of equipments for the study of eye in that era, it is quite proud and appreciable fact. We can surely anticipate their efforts regarding thorough knowledge of ophthalmology.

#### Netra Sharir <sup>3-7</sup>

The references imply that alternative terms like Aksham, Lochanama, Nayanama, Darshanama, Netrama, Ekshanama, Chakshu, Akshini, Druka, Akshi Golaka and Drushti were coined for the eyeball. Akshi Kaninika, Kanin, Kaninak, KaninikSandhi, Kaninika, Kanini and Netrakshi Sandhi; all these terms were used in Samhitas to denote inner canthus. Outer canthus is termed as Apanga. From all the references it is elicited that the joint between nose and eye medially (i.e. Inner Canthus) is defined as Kaninika and Akshi-Kaninka, whereas joint lateral to eyeball is defined as 'Apanga'.

**Akshikuta, Prekshan Kuta, Akshikutaka.**<sup>8-9</sup>

Most of the Vaidyas consider 'Akshikuta' as area below the eyeball because of the reference of 'Shotha' in Pandu Vyadhi (Akshikuta Shotha). This swelling is evident in area below the eyeball. But Acharya Dalhana has defined 'Kuta' as "Kutosthi Shikharam Shrungam". This implies that 'Kuta' should have an elevation. It is referred to supero-medial elevation of orbital cavity (superciliary arch). Further he defines 'Bhru' (eye brow) as hairs above 'Akshikuta'. The above interpretation is further supported by references from Sushruta Samhita 'Mudhgarbha Chikitsa and Kashyapa Samhita, Vedana Adhyaya. Sushruta while describing surgical removal of Mudha garbha states that Garbhashanku (forcep) should be fitted firmly at Akshikuta. Practically this means Akshikuta must be an area where forcep (Garbha-Shanku) can hold firmly. This area is best suited at superciliary arches. Acharya Kashyapa has described itching at Akshikuta (superciliary arch) as one of the symptoms of Kukunaka.

**Akshi Kotar, Kotar.**<sup>10</sup>

Describing the 'Asadhyata' of Visuchi and Alasaka, Sushruta refers to the symptom 'Abhyantaryat Netra' which is explained by author of Madhukosha as Kotarantaha Pravishtakshigolakaha (sunken eyes). It means Akshi Kotar (Kotar) refers to orbital cavity.

**AkshiKosha, AkshiPutra, AkshiBandhani, AkshiVartma, AkshiVartma Kosha, Netra Kosha, Netrachhadan, NetraPutra,**<sup>11-12</sup>  
**Vartma, Vartma Kosha, Vartma Patal, Vartma Mandal, Vartma Mandal Tarunasthi, Vartma Sandhi, Vartma Shukla Sandhi.**<sup>13-15</sup>

These are the terms used by Acharyas denoting eye lid and accessory structures. References regarding eyelid by different authors are as follows. Akshikosha, Netrachhadan, Netrakosha, Akshiputa are the term coined by Sushruta and Dalhana denoting the location of cartilages (tarsal plate) in the eye lid. Sushruta has used Vartma Mandala and Vartma Patala to suggest eyelids. Vartma Mandala refers to both eyelids whereas Vartma Patala refers to upper eyelid. Vartma Mandal Tarunasthi in Sushruta suggest the tarsal plate where as Vartma Sandhi suggests as inner and other canthus.

The term 'Netrakosha' is used by Sushruta in Tarpan Kriya chapter. While describing sites of oblique incision Sushruta used the term 'AkshiPutra' where as Dalhana refers as Akshivartma. Sushruta has used the term 'Vartma' in Dahakarma, Dalhana explains the meaning of Vartma as covering of eyeball (eyelids). Charaka used the term as 'AkshiVartma' in Pratyanga Shareer. The term VartmaKosha is coined in Sushruta Uttartantra to describe inflammatory conditions of eyelid. This implies palpebral part of conjunctiva. Vartma-Shukla Sandhi refers to the junctions of palpebral and bulbar conjunctiva.

**AkshiBandhani**<sup>16</sup>

In Sharira Vichaya Shareer and Aasanna Prasava chapter, Acharya Kashyapa used the term 'AkshiBandhani' which implies to the muscles of eyeball.

**Akshigolaka, DrushtiGolaka, Nayan Budbuda, Netra-Budbuda.**<sup>17</sup>

All above terms are suggestive of eyeball or bulb of the eye. While describing external features of eyeball Sushruta used the term NetraBudbuda. Same term appears in Uttartantra while explaining Panchabhautik nature of eyeball.

**AkshiGolaka Twaka,**<sup>18</sup>

Dalhana has coined the term AkshiGolaka Twaka while describing Anjana Vidhi. This reference clearly denotes the region of bulbar conjunctiva. In description of Arshovartma Dalhana refers to the term Vartma as Bahya and AntarVartma i.e., external and internal membranes in eye lid. Hence Akshingolaka Twaka can be considered as palpebral and bulbar conjunctiva together. While describing symptoms of Shyava Vartma Acharya Sushruta used the terms AntarVartma and BahyaVartma. This implies Antarvartma as palpebral conjunctiva.

**Akshi Taraka, Krushna Taraka, Krushna Mandala, Krushna Gola, Taraka,**<sup>19</sup>

The terms like AkshiTaraka, Krushna Taraka, Krushna Mandala and Krushnagola are mentioned at different places in Ayurvedic texts which imply the structure iris.

**Shuklataraka, Tejoalashrita Bahya Patala**<sup>20</sup>

These terms refer to cornea as it is described during surgical procedure of Linga Nasha (cataract). The description of Savrana Shukla, Avrana Shukla and Akshki-Pakatyaya refers to corneal injuries. Hence 'Shukla taraka' term was used to denote cornea. In Sushrut Samhita Uttartantra Tejoalashrita Bahya Patala is also used to denote cornea.

**Akshi Pakshmani, Pakshmagrani, Pakshmani, Pakshma Mandala, Pakshmeshaya, Pakshmamula.**<sup>21</sup>

These terms denote the eyelashes. The arrangement of hairs on upper and lower eyelids together forms a circle hence the word Pakshma Mandala is coined which is ciliary circle in modern ophthalmology.

**Ashru Marga, Ashru Vahinyo, Netra Nadi.**<sup>22</sup>

While describing Puyalasa (Dacryocystitis) Acharya Sushruta and Dalhana both have described Ashru Marga and Netra Nadi. It means that lacrimal apparatus was known to both Acharyas. The term Ashru Vahini was also coined by Sushruta for the lacrimal apparatus.

**Nimeshini and Unmeshini Sira**<sup>23</sup>

Sushruta and Dalhana refer to a disease VartmaNimesha in which a symptom of winking of eyes is evident. Both explain that this phenomenon occurs due to defect in Unmeshini and Nimeshini Sira. This disease is also described in modern ophthalmology as blepharospasm. It is said to be caused by spasm of muscles due to stimulation of ocular branch of facial nerve and oculomotor nerve. As facial nerve (ocular branch) regulates closing of eyelids, we can correlate it with Nimeshini Sira and oculomotor nerve regulates opening of eyelid we can correlate with Unmeshini Sira.

### Drushti, Drushti Patala, Drushti Bhaga<sup>24</sup>

Sushruta describes the Lingnasha (cataract) as a disease of Drushti. This implies that term Drushti is used for lens. Dalhana has described Drushti Patala as a seat of Aalochaka Pitta which is essential for proper vision. As per modern ophthalmology retina is site of image formation hence Drushti Patala can be correlated with retina.

### Other References showing attempts to study NetraSharir-<sup>25</sup>

Srikantha Datta explains ratio of Taraka (Iris) and Drushti (lens) as Taraka is 9<sup>th</sup> of Drushti. Vagbhata considers the size of Drushti as 9<sup>th</sup> part of Krishna Mandala. He also described size of Drushti as of 'Masur dala' (Red pea). The term Drushtyantara described by Acharya Vagbhata refers to inter papillary distance as four Angula.

### CONCLUSION

From the present study it is evident that ancient sages especially Dhanvantari Sampradaya was well aware of not only gross anatomy of eyeball but also they had in-depth knowledge ophthalmological anatomy. This knowledge was scattered as the Dhanvantari Sampradaya was practicing medicine and surgery 6000 years back i.e. before discovery of scripts and printing technique. After gathering references from the different Samhitas and their commentaries by different authors, it is clear that they had full knowledge of anatomy of eyeball. That is why they could treat diseases of eyeball clinically and surgically as well. It is again evident that the knowledge in ancient Ayurvedic text withstands with the facts in modern ophthalmology to a great extent.

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