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## A Brief Review of Ophthalmology In Indian Classical Literature

Prabhakar Vardhan<sup>1</sup>  Sanjeev Sharma,<sup>2</sup> Shamsa Fiaz<sup>3</sup>

1. Assistant Professor, Dept. of Shalaky Tantra, National Institute of Ayurveda Deemed to be University (De-novo), Jaipur, Rajasthan.
2. Vice Chancellor, National Institute of Ayurveda Deemed to be University (De-novo), Jaipur, Rajasthan.
3. Professor and Head, Dept. of Shalaky Tantra, National Institute of Ayurveda Deemed to be University (De-novo), Jaipur, Rajasthan.

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#### Corresponding author-

Prabhakar Vardhan, Assistant Professor, Dept. of Shalaky Tantra, National Institute of Ayurveda Deemed to be University (De-novo), Jaipur, Rajasthan,

Email: [shalakya007@gmail.com](mailto:shalakya007@gmail.com)

### ABSTRACT:

Shalaky Tantra existed from ancient times, however not clearly. In pre-Vedic India, copper and bronze rods (*Shalaka*) were used to apply *Anjanas* (collyria) to avoid eye problems. Even though Shalaky tantra isn't mentioned in Vedic literature, eye anatomy and illnesses were known and treated in that age. Rigveda, the oldest known treatise, mentions eye illness treatment. Yajurveda mentions various eye components. Atharvaved addresses Netra's synonyms, eye disorders like *akshi-yakshma*, and their symptoms. In Brahmanas and Upanishadas, the eye and its functions are described, along with blindness, netrasrava, and blindness cure. Shalaky word isn't mentioned. Shalaky Tantra was defined in the Samhita period, when Ayurveda developed in eight branches. Eye illnesses induced by *Vata*, *Pitta*, *Shleshma*, and *Sannipata* are listed in Lalitvistara text of Buddhist literature. Panini calls Shalaky experts '*Shalakkii*' and describes *timira* and *arma*. Eye illnesses aren't discussed in Agnivesha Tantra (Charak Samhita) in detail. In carak samhita Eye illnesses are characterised by *doshic* predominance and their origin and therapy are outlined. First 19 chapters of Shalaky are on ophthalmology. Sushruta Samhita describes local ocular therapeutic measures such as *Kriya kalpa* (*Tarpana*, *Putpaka*, *Seka*, *Aschyotana* and *Anjana*) and surgical techniques for treating eye problems. His eye surgical contributions are impressive. He discovered cataract surgery perhaps first. Vagbhatta detailed newer therapy techniques as *Vidalaka*, *Gudana*, and *Sandhavanjana*, along with new formulations and procedures. Acharya Madhava characterised ocular ailments after Sushruta, adding *Kunchana* and *Pakshmathata*. Bhavaprakasha. Yog Ratnakar, etc. described ophthalmology similarly to Sushruta Samhita with formulations for their treatment.

**Keywords:** Indian religious texts, Ancient Indian texts, Ophthalmology, Ayurveda, *Netra Roga Chikitsa*

### INTRODUCTION

Preservation of health has been instinctive necessity of mankind from the very beginning of creation. That is why Acharya Charaka has said that Ayurveda (the science of life) as beginning-less and eternal.<sup>1</sup> Susruta, going a step

further, says that the creator has delivered it even before creation.<sup>2</sup> Going by these statements, Shalaky Tantra in general and ophthalmology in particular were also in existence since earliest history though not in a well-defined



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manner. In fact, we find evidences in excavations of Harappa and Mohenjo-daro that proves that *anjanas* (collyria) were used to prevent eye diseases by people of Indus valley civilization in pre-Vedic era and metal rods (*Shalaka*) of copper and bronze were used for their application.<sup>3</sup>

Later on, with the advent of Vedic age all the branches of the healing art developed further. Even though we don't find mention of Shalakyia tantra as such in Vedic literature, there are enough evidences to support that anatomy and diseases of eye were known and treated in that era.

### Review Question

To determine whether there are descriptions of ophthalmological relevance in ancient Indian texts.

### Data Collection Method

Veda, Puranas, traditional books pertaining to religions of Indian origin and Ayurveda texts, as well as books pertaining to historical relevance were used to search for relevant literature besides various research papers. Websites of various religions and sects were also searched for relevant material and terms "*netra*", "*chakshu*", "*anjana*" "*lochana*" etc. synonyms for eyes and names of various Ayurvedic ocular procedures in Sanskrit/Hindi were used in electronic data searches.

### Ophthalmology in Indian classical literature

#### Ophthalmology in the Vedic period:

In Rigveda, the oldest considered creative on earth, there are some references regarding the treatment of diseases of the eye. The Ashvini brothers revived the eyesight of *Rujrasva*,<sup>4</sup> *Kakshivat*,<sup>5</sup> and *Kanva*<sup>6,7,8</sup> *Paravruja*<sup>9</sup> was treated for blindness by Indra and Ashvini kumaras. Soma rescued the blind and lame from their defects<sup>10</sup> and Atri made eyes for Bhaskara by mantras.<sup>11</sup> We also find mention of the disease *Netrapuya* in Rigveda.<sup>12</sup> In Yajurveda, there are several references where parts of the eye are addressed.<sup>13,14,15,16,17</sup> The disease *Arma* (pterygium) is explained in Shukla Yajurveda perhaps for the first time.<sup>18</sup>

Atharvaveda, of which Ayurveda is said as a Upaveda, gives knowledge about further advancement in the knowledge of ophthalmology. Synonyms of *Netra* are given as *Chaksu*, *Chakshmani*, *Netra*, *Akshi*, etc.<sup>19</sup> *Netra* is even enumerated as one of the ten embodied deities.<sup>20,21,22</sup> There are several references for diseases of the eye like '*akshi-yakshma*' etc.<sup>23,24,25,26,27</sup> and signs and symptoms of eye diseases like '*bhabusu*' and '*bhabhusukarum*' (meaning congestion of the eye). The role of *Nadeya Jala* (River water), *Akashodak*, *spring water*,<sup>28,29</sup> *Kushtha*

(*Vishvabhaishaja*),<sup>30,31,32,33,34</sup> *Avaya* (*sarshapa*=mustard) *Abhyanga*,<sup>35</sup> *Yashad* (*zinc*), *Manikyia* (*ruby*),<sup>36</sup> etc. as well as an elaborate description about *Anjana*, its properties and mode of administration in ocular disorders and for improvement of the eyesight<sup>37,38</sup> are also available. *Anjana* was used in four ways as collyrium, as an amulet, for smearing and intake. It cured congestion of the eyes besides other ailments. The sensory organs are described in *Kensutra* of *Atharvaveda* with proper systemic location and specialty of the eyeball in the skull along with seven apertures situated in the skull.<sup>39,40</sup>

### Ophthalmology in Brahmanas and Upanishads:

The period of Brahmanas and Upanishads is very important because this was an era of deep thinking, inquisitiveness, discussions, and patient inquiry into the root cause which led to the evolution and systemization of ophthalmology. In *Aitreya Brahmana*, the eye and its functions are defined along with other sense organs.<sup>41</sup> *Anjana* was used to promote eyesight.<sup>42</sup> In *Jaiminiya Brahmana*, *Andhatva* (*Blindness*),<sup>43</sup> *Netrasrava*<sup>44</sup>, *treatment of netrasrava* and consequent blindness<sup>45</sup> and saturation of eyes with ghee<sup>46</sup> are mentioned. There is a '*Chaksusya*' hymn for the prevention of eye disorders.<sup>47</sup> In *Shatpath Brahmana*, there are many important references to the anatomy of the eye.<sup>48,49,50,51,52</sup> Eye has been described as *Agni-Soumya*.<sup>53</sup> The *Nimeelan-Unmeelan* (opening and closure of eyelids) *kriya* of eyes has also been described in *Shatpath Brahmana*.<sup>54</sup> Diseases of the eye<sup>55,56</sup> as well as *ghrita* as excellent *Chaksushya*,<sup>57</sup> are also mentioned.

Upanishads contain the philosophical version of ancient seers which includes many facts and concepts related to ophthalmology. In *Vrihad Aranyakopnishad* in a more or less philosophical manner, different structures of the eyeball have been said to be evolved from different deities<sup>58,59</sup> Table no 1. Adhipati (God) of Eyes part

A separate treatise, *Chaksushyopanishada* was composed in which 40 to 45 mantras are explained for the improvement of vision through *Suryopasana* i.e. worship of God Sun.<sup>60</sup>

Despite the available description of the eye, we do not find the word *Shalakyia* in these texts. It was only in the *Samhita* period, when eight branches of Ayurveda were defined, that we come across the terminology *Shalakyia Tantra*, which deals with the diseases of the eye, ear, nose, oropharyngeal cavity, and *Shiras* (head). It is interesting to note that in both *Charaka* and *Sushruta Samhitas*, *Shalalakyia* occupies a prior place, in *Sushruta*, it comes next to *Shalya* in the second position, and in *Charaka*

Samhita also it occupies the second position next to Kaya Chikitsa. Out of the subspecialties of Shalakyas, ophthalmology has received maximum attention in the classics of Ayurveda, indicating that probably ophthalmology had been the most popular branch practiced by the experts of Shalakyas Tantra in the ancient times. Nimi, Satyaki, Karal, etc. are famous ophthalmologists who contributed greatly to the field of diseases of the eye.

#### **Ophthalmology in Puranas:**

Puranas are so-called as they describe the old traditions.<sup>61</sup> In Vishnu Purana, eye diseases are grouped under sharira rogas.<sup>62</sup> Akshirogas and their treatment have been mentioned in both Markandeya Purana and Garuda Purana.<sup>63,64</sup> The widely prevalent practice of sprinkling water on the eyes, while the mouth is filled with water, has been described in Agni Purana for preventive purposes.<sup>65</sup> In Vayu Purana, treatment of blindness arising in course of the faulty practice of yoga is mentioned.<sup>66</sup>

#### **Ophthalmology in Buddhist literature:**

Ayurveda came into existence long before the emergence of Lord Buddha (624-544BC) and naturally, Buddhist tradition imbibed all the previous and then present culture giving it the particulate hue and color. In the Buddhist tradition, the Tripitaka literature is the oldest source to have a glimpse of Indian Ophthalmology. Mahavagga, in the book VI on medicaments, mentions the use of application of eye ointments and collyria with shalaka for eye diseases.<sup>67,68</sup> Besides this, there are many instances of Jivaka, the personal physician of Lord Buddha, proving his excellence in the field of Shalakyas.<sup>69</sup> Similarly, the Mahayana texts throw a flood of light on Buddhist tradition. Lalitvistara is one of the nine important texts which deal with the advent of Lord Buddha and his teachings. In the context of diseases, those caused by Vata, Pitta, Shleshma, and Sannipata, the disease of the eye have also been mentioned.<sup>70</sup> Jatakamala of Aryasutra, though a text of poetry, furnishes a good deal of information. In the story of Sivijataka, there is mention of transplantation of the eye.<sup>71</sup> Ravigupta, son of Durgagupta, a Buddhist scholar composed the Siddhasara. It contains 31 chapters out of which one chapter is entirely dedicated to Shalakyas.

#### **Ophthalmology in Jaina tradition:**

Like Buddhists, Jainas had a distinguished tradition of medicine which was known as Pranavaya. In one of the important Jaina literature the Acarangasutra, blindness is enumerated along with 15 other diseases.<sup>72</sup> In the Utradhyanasutra, there is mention of eye diseases in a story.<sup>73</sup> and anointing of the eye is cited as one of the

methods of treatment.<sup>74</sup> In another authoritative text available on the Pranavaya tradition of medicine, the Kalyankaraka, Ugradityacharya has mentioned Pujiyapada as the preceding author in the Shalakyas branch. The text contains twenty chapters, Uttarantra consisting of five chapters and two appended chapters. Shalakyas has been described in the 15th chapter with the importance of the eye and description of 76 eye diseases and their treatment.

#### **Ophthalmology in other non-medical sources:**

Ayurveda has been a part and parcel of the culture of India and as such is mixed up in the entire Indian documents. Even the literature which is commonly brushed aside as non-medical contains valuable information about the theory and practice of ophthalmology. Panini, in his famous Ashtadhyayi, has described Timira<sup>75,76</sup> Arma,<sup>77</sup> and Kanah.<sup>78</sup> He has denominated the Shalakyas expert as 'Shalakiki'.<sup>79</sup> Pilla, an eye disease is added by Katyayana.<sup>80</sup> Kautilya's Arthashastra in the Mauryan period contains references to Anjana used to restore vision. Banabhatta, the famous cortege of King Harshavardhan, in his poetic works, Harshacharita and Kadambari, provides valuable information on the status of ophthalmology in that period. Here, the term 'Ashrusrotas' is mentioned for lacrimal ducts.<sup>81</sup> Of eye diseases, *Abhishyanda*,<sup>81</sup> *Shotha*,<sup>82</sup> and *Timira*<sup>83</sup> are mentioned which were treated with the application of *Anjanas and Vartis*.<sup>84</sup> *Siddhanjana* was common which was applied with a wooden stick (Shalaka) but on improper use destroyed the eyes.<sup>85</sup> Likewise, excessive application of irritant drugs caused defects of vision.<sup>86</sup> In swelling of eyes, *Manahshila (realgar)* was applied on lids.<sup>87</sup> Hot water fomentation was done in the cases of *Netrabhishyanda*.<sup>88</sup>

#### **Ophthalmology in the Samhita period:**

Agnivesha Tantra (Charak Samhita) is considered to be the oldest treatise on Ayurvedic medicine. Being a medicine-oriented text, the details of eye diseases are not described in this Samhita. Eye diseases have been classified into 4 types according to doshic predominance<sup>89,90</sup> and their etiology and treatment are described in brief.<sup>91,92</sup> There are scattered references to Anjana<sup>93,94,95</sup> Vidalak, Tarpana<sup>96,97</sup> etc. A complete chapter has been dedicated to the description of sense organs including Chakshu.<sup>98</sup> A few disseminated references to eye diseases like Vartmastambha, Vartmasankocha, Timira, Akshivyudas,<sup>99</sup> Akshipaka,<sup>100</sup> Akshiraga, Netrashula,<sup>101</sup> Pilla roga, etc. are also found in the text. Bhela, a contemporary of Agnivesha, in his treatise has described two types of Alochaka pitta - one related to optical vision (Chaksu-vaishesika) and the other to mental vision (Buddhi-vaishesika).<sup>102</sup> This

division of Alochaka pitta is not found in any other Ayurvedic text. Probably this is essentially the same as Chaksu-buddhi in Charak Samhita.<sup>103</sup> Vriddha Jeevaka Tantra, also known as Kashyapa Samhita, being a pediatric specialty text does not have many ophthalmic references, but its description of Kukunaka roga with detailed treatment is splendid. It is important to note that even before the advent of Samhitas, the knowledge of ophthalmology was well developed and organized. Various specialists had written separate treatises of their own. Unfortunately, those texts are not available now, but their references have been quoted in Samhitas and their commentaries:

1. Nimi Tantra: It was a complete Shalakya text. Though the original book is not available, frequent references are found in Nibandha Samgraha commentary on Sushruta Samhita. Sushruta himself mentioned that he followed Nimi Tantram while writing the Shalakya part of Sushruta Uttara sthana. A Vartmagata disease Nimesha is named after him.
2. Satyaki Tantra: Dalhana mentioned his name as the author of Shalakya text. According to him, Netra rogas are 80.<sup>104</sup> He introduced the couching system of treatment for cataracts.
3. Karala Tantra: Written by Karala, the references are given by Gireendranath Mukhopadhyaya and G.N. Sen. Karala is said to have been the disciple of Nimi.<sup>105</sup> Enumeration of eye diseases as ninety-six in number by Dradhabala is explained by Chakrapani to have been borrowed from Karala. Further classification of eye diseases has also been described by Chakrapani following Karala.<sup>106</sup> Other tantras ascribed to Gargya, Galva, Chaksusya, Bhrigu, Shounak, Krishnatreya, Kankayana, and Bhoja are also referred to in various commentaries. The complete and elaborate description of Shalakya diseases is found in Sushruta Samhita Uttara tantra which was supplemented by Nagarjuna. He devoted 26 chapters to Shalakya out of which the first 19 chapters are exclusively concerned with ophthalmology. Eye specialists were known as 'Drishtivisharada'.<sup>107</sup> He described 76 diseases of the eye following Videha Tantra, in a most systematic manner with the classification of the diseases in a sequential pattern based on their anatomical components. These are as follows –
  - a) Based on Doshas - *Vataja, Pittaja, Kaphaja, Raktaja, Sannipataja*<sup>108</sup>
  - b) Based on treatment - *Chhedya, Bhedya, Lekhya, Vedhya, Ashastrakrita*<sup>109</sup>
  - c) Based on site - *Vartmagata, Sandhigata, Shuklagata, Krishnagata, Drishtigata, and Sarvagata*<sup>110</sup>

- d) Based on prognosis- *Sadhya, Yasya, Asadhya*.

Besides, local ocular therapeutic measures in the form of *Kriya Kalpa (Tarpana, Putpaka, Seka, Aschyotana, and Anjana)* as well as surgical interventions have been described elegantly in Sushruta Samhita for treating eye diseases. His contribution to eye surgery stands as spectacular. Probably he is the earliest in discovering cataract surgery.<sup>111</sup> Apart from cataract surgery, Sushruta's operations for entropion (Pakshmakopa), pterygium (Arma), incision of a styne (Anjananamika), scrapping (Lekhana) for trachoma (Pothaki) still holds the test of time.

#### **Ophthalmology in the Samgraha period:**

The beginning of this period is considered with the advent of the treatises of Acharya Vagbhatta. He compiled the quintessence of the two principal Samhitas and other available treatises and created Ashtanga Hridya and Ashtanga Samgraha. Ashtanga Hridya is considered the simplified and concise version of Ashtanga Samgraha. In the context of ophthalmology, Acharya Vagbhatta perhaps followed the Karala school of thought and described 95 diseases of the eye (Ashtanga Samgraha Uttara sthana chapter 11 to 20 and Ashtanga Hridaya Uttara sthana chapters 8 to 16). Obviously, many newer ophthalmic diseases like Kricchronmeelana<sup>112,113</sup> etc., and elaboration of previously described diseases have been done in Vagbhatta treatises. He described four types of Anjanas<sup>114</sup> as opposed to three types in Sushruta Samhita<sup>115</sup> and even described the 6 types of Anjanas based on their Rasa with their specific containers<sup>116</sup> and applicators (Shalaka).<sup>117</sup> He described many newer treatment modalities like *Vidalaka, Gudana, Sandhavanjana*, etc. besides many new formulations and details of procedures. Only Sharangadhara added Pindi to the list of treatment modalities later on.

Acharya Madhava in his work on Nidana, the Roga Vinischaya has described the ophthalmic disorders perhaps following the tradition of Sushruta but added two diseases Kunchana<sup>118</sup> Pakshmathata<sup>119</sup> and thus described 78 eye diseases.<sup>120</sup> Srikanthadutta in his commentary on Madhukosha states that Kunchana was borrowed by Madhava from some other treatise, while Pakshmathata is equated with the disease called Kricchronmeelana by Vagabhatta.

Other Samgraha granthas eg. Bhavaprakasha, Yog Ratnakar, etc. described ophthalmology as more or less similar to Sushruta Samhita with their addition of formulations. Although no newer concept evolved

regarding eye diseases, the ophthalmic therapeutics were enriched by later Acharyas in the Medieval period and the era of Rasa Shastra.

## DISCUSSION

The ancient Indians were remarkably well-versed in various elements of ophthalmology, including anatomy, surgery, and medical interventions; they were able to identify and treat a number of eye disorders. In ancient literature, there have been several examples of all this. The treatment at that time included a wide variety of plant, animal, and mineral sources. Although the practice of ophthalmology can be traced back to ancient times, the interpretation of certain discoveries has remained a point of contention. Sushruta is widely regarded as the father of Indian ophthalmology. The modern developments of ophthalmology were mostly concentrated in the last fifty years, after the Second World War. With the advances in technology, machines have acquired more attention than the man. The last fifty years have provided investigative and curative facilities beyond expectations.

## CONCLUSION

The concluding sections of the Sushruta Samhita, a colossal book on surgery, contained a complete volume of eye anatomy and pathology, and therapeutic measures. Among the 76 eye disorders (Nayana-Budbada) detailed in the Uttara Tantra compendium, which was known as the Uttara Tantra, were 51 that could be treated surgically. In addition, Sushruta documented an extracapsular cataract extraction in the Samhita, which may be the first of its kind. The fact however remains that the edifice of modern ophthalmology is based on yesterday and that yesterday started from ancient seers of Vedic times and slowly passed to the Greeks, Romans, and finally the Christian era.

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## ORCID

Prabhakar Vardhan , <https://orcid.org/0000-0001-7611-3886>

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**Table no 1. Adhipati (God) of Eyes part**

<b>Part</b>	<b>Adhipati (God)</b>
<i>Rakta-Raji</i>	<i>Rudra</i>
<i>Jala</i>	<i>Parjanya</i>
<i>Kaneenaka, Ashrumargas</i>	<i>Aditya</i>
<i>Krishna Mandala</i>	<i>Agni</i>
<i>Shukla mandala</i>	<i>Indra</i>
<i>Adho-vartama</i>	<i>Prithvi</i>
<i>Urdhawa-vartama</i>	<i>Akash</i>