

## REVIEW ARTICLE - SHUSHKAKSHIPAKA IN AYURVEDA (EVAPORATIVE DRY EYE DISEASE)

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### ABSTRACT

The disease *Shushkakshipaka* considerably attracted the ancient physicians, which is evident from their detailed description, symptomatology and management written in *Samhitas*. It has been said that the disease *Shushkakshipaka* is a curable entity. On reviewing the clinical presentation from the classical Ayurvedic text *Shushkakshipaka* resembles Dry eye disease. The population suffering from Dry eye disease are increasing day by day. Dry eye disease (DED) is a growing public health concern causing ocular discomfort, fatigue and visual disturbance that interferes with quality of life, including aspects of physical, social, psychological functioning, and workplace productivity. Evaporative dry eye (EDE) is the most common form of dry eye disease. In the present treatment modalities of dry eye disease, artificial tears provide only symptomatic relief but does not resolve underlying inflammation of the disease. The treatment principle for *Shushkakshipaka* mentioned in Ayurveda classics are *Tarpana*, *Seka*, *Aschyotana*, *Anjana* etc. which are known to increase the stability of tear film and give relief from the symptoms of *Shushkakshipaka*. The goal of this article is to compile information on *Shushkakshipaka* and Dry eye disease types, aetiology, pathophysiology, diagnoses, and treatment of evaporative dry eye disease.

### INTRODUCTION

One of the oldest holistic treatment systems in the world is *Ayurveda*. It is predicated on the notion that wholeness and good health depend on a fine balance between the mind, body, and spirit.<sup>[1]</sup> In addition to being regarded as the fifth *Veda*<sup>[2]</sup> itself, *Ayurveda* traces its foundation from *Atharvaveda* as a "Science of Life."<sup>[3-4]</sup> *Shalaky Tantra* has its own important place among eight divisions of *Ayurveda*. *Acharya Nimi* is the expounder of this branch of *Ayurveda* and his text is reproduced in the foremost chapter of *Uttaratantra*, part of *Sushruta Samhita*. *Acharya Sushruta* described 76 eye diseases<sup>[5]</sup> in 1-19 chapter on eye disorder, which reflect importance of eye.

*SHUSHKAKSHIPAKA*, a disease of *Sarvagata Aushadh Sadhya Netra Roga* is described in *Sushruta Samhita Uttaratantra* 6<sup>th</sup> chapter and by *Acharya Vagbhatta* in *Uttaratantra* 15<sup>th</sup> chapter under *Sadhya Vyadhi*.<sup>[6-7]</sup> Different *Acharyas* has postulated different views on *Dosha* vitiation in *Shushkakshipaka*. It is said to be *Vataja* by *Sushruta*, *Vata-Pittaja* by *Vagbhatta* and *Vata-Raktaja* by *Karala*, *Madhava*. Based on sign and

symptoms, *Shushkakshipaka* has similarities with Dry Eye Disease. Dry Eye Disease is defined as a "multifactorial disease of the tears and ocular surface that results in symptoms of discomfort, visual disturbance, and tear film instability with potential damage to the ocular surface. It is accompanied by increased osmolarity of the tear film and subacute inflammation of the ocular surface."<sup>[8]</sup> It occurs when either the eye does not produce enough tears or when the tears evaporate too quickly.

### SHUSHKAKSHIPAKA

#### ETYMOLOGY

The word *Shushkakshipaka* is derived from:

1. *Shushka*: made from root 'Shush' and 'Ktah' suffix meaning dry, dried.<sup>[9]</sup>
2. *Akshi*: made from root 'Ash' and 'Kisah' suffix meaning eyes.<sup>[10]</sup>
3. *Paka*: made from root 'Pach' and 'Ghana' suffix meaning burning, ripening, cooking.<sup>[11]</sup>

### NIDANAS OF SHUSHKAKSHIPAKA

There have been no specific *Nidanas* of

*Shushkakshipaka. Samanya Nidana* of all *Netra Rogas* can be concluded for the manifestation of this disease.<sup>[12]</sup>

### Samanya Nidanans according to several Acharyas

Table No: 01.

Causative factors	Su.	M.N	B.P	Y.R	V.S
Diving into water after exposure to heat or Sunlight	+	+	+	+	+
Continuously looking at distant objects	+	+	+	+	+
Alterations in sleep habits (Sleeping during day/awakening at night)	+	+	+	+	+
Excessive weeping	+	+	+	+	+
Anger/grief	+	+	+	+	+
Injury to head	+	+	+	+	+
Excessive use of sour, gruel and vinegar	+	-	+	-	-
<i>Kulattha</i> and <i>Masha</i> pulses	+	-	+	-	-
Suppression of natural urges	+	+	+	+	+
Excessive perspiration	+	+	+	+	+
Smoking or working in smoke	+	+	+	+	+
Suppression of/or excessive vomiting	+	+	+	+	+
Suppressing tears	+	+	+	+	+
Concentrating on minute objects	+	+	+	+	+
Intake of fluids and other foods at night	-	+	-	+	+
Alcohol	-	+	-	+	+
Alterations in seasons	-	+	-	+	+
Traveling in very high speed	-	-	+	-	-

According to *Acharyas*, there are three aetiologies that lead to sickness. Regarding *Chakshurendriya*, the following can be taken into consideration in the case of "Evaporative Dry Eye":

#### Asatmendriyarthā Samyog

##### ❖ Atiyoga

Seeing very bright screens for long periods of time without blinking frequently causes evaporation of tears.

##### ❖ Heenayoga

Remaining in complete darkness or even very low light, observing objects just dimly or not at all (without using the eyes). Reduced blinking while using digital screens.

##### ❖ Mithayoga

Seeing for a long-time object which are very near or very far, concentrating on the small letters over the screen. The immediate environment, such as poor visual hygiene, poor workplace ergonomics, viewing objects closer than six inches away or at an uneven height from the monitor, and looking at bright (shining) objects. It is also possible to classify improperly viewing computer or TV screens as a form of *Chakshurendriya's Mithayoga*.

#### Pragyapradha

The practise of *Sadvritta* is beneficial for maintaining

#### SAMPRAPTI GHATAKA

Table No. 02.

<i>Dosha</i>	<i>Vata</i> ( <i>Sushruta</i> ), <i>Vata-Pitta</i> ( <i>Vagbhatta</i> ) or <i>Vata-Rakta</i> ( <i>Madhavkara, Karala</i> )
<i>Dushya</i>	<i>Rasa</i> ( <i>Ashru</i> ), <i>Rakta</i> , <i>Meda</i> , <i>Majja</i>
<i>Shrotas</i>	<i>Rasa and Raktavahi Siras</i>
<i>Shrotodushiti</i>	<i>Sanga</i>
<i>Adhithana</i>	<i>Sarvagata</i>
<i>Sadhyata Asadhyata</i>	<i>Sadhya</i>

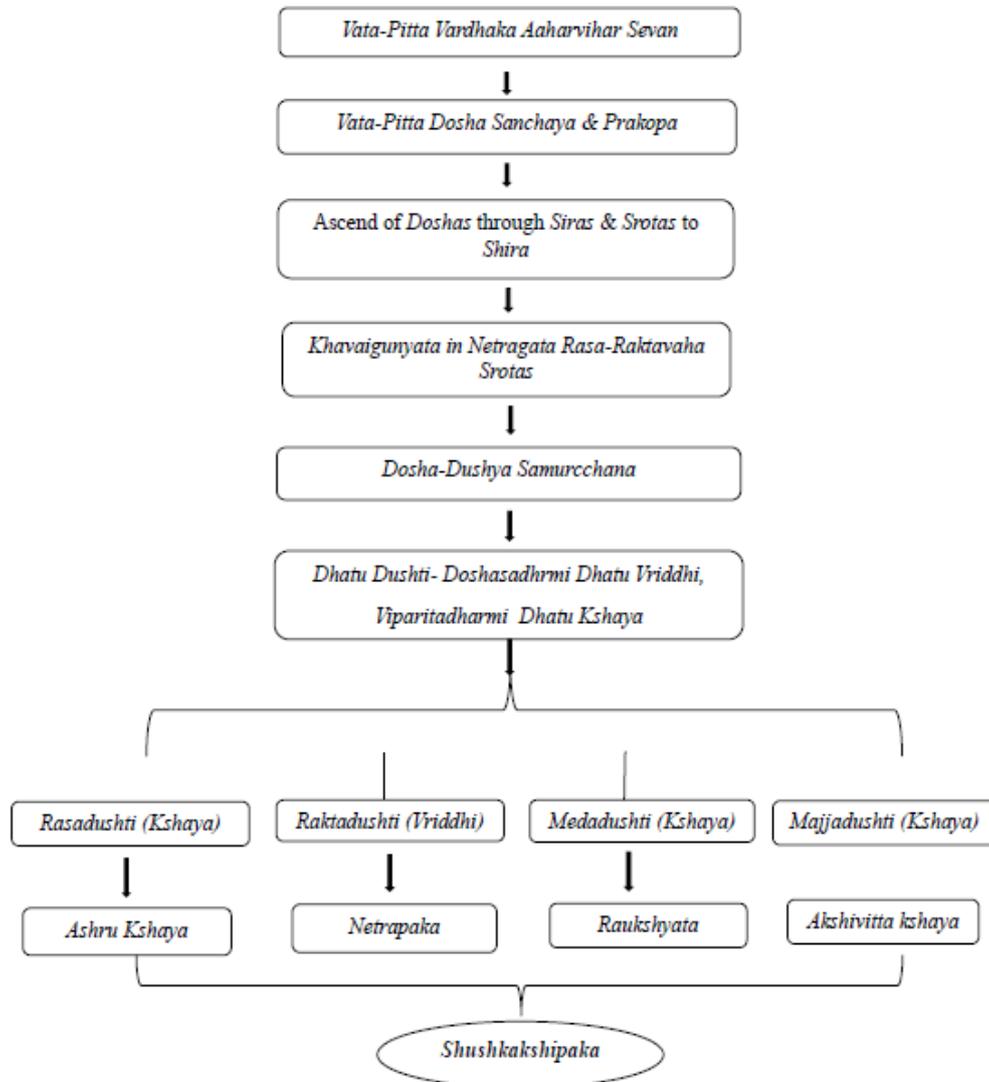
health, while deviation results in illness. The term *Pragyaparadh*<sup>[13]</sup> refers to performing work without adequate understanding, *Dhi*, or *Buddhi*, *Dhriti*, and *Smriti*. This results in *Dosha Vaishamya*, which causes sickness. Currently, an uncontrolled use of computers due to an excessive affinity (due to *Rajas Dosha*) for them or an ignorance of how to utilise them serves as a disease-causing factor.

#### Parinama

*Kala* is referred to in *Parinama*.<sup>[14]</sup> Three forms of *Kala - Sheeta, Ushna, and Varsha* are distinguished based on *Ritu's* qualities. *Ritu* alludes to *Atiyoga, Hinayoga, and Mityayoga* when it speaks about these traits excess, mildness, and transformed look. *Kala* is a necessary component for the emergence of any disease.

#### SAMPRAPTI

**Samanya Samprapti of Netra Roga**<sup>[15]</sup>: The *Samanya Samprapti* of all *Netra Roga* can be viewed as the foundation for comprehending the *Samprapti* of *Shushkakshipaka*. According to *Acharya Sushruta*, the vitiated *Doshas* spread to *Jatru Urdhva Bhaga* through the *Sira* and manifest the pathophysiology.

**SAMPRAPTI OF SHUSHKAKSHIPAKA****POORVAROOPA OF NETRA ROGAS**

Acharyas have described Poorvroopa of all Netra roga in general in as<sup>[16]</sup>

**Table No: 03**

S.NO.	Poorvarupa	Features
1	Avilata	Eyes filled with discharges or tears
2	Sa Samrambha	Congestion or swelling
3	Ashru	Watering
4	Kandu	Itching
5	Upadeha	Stickiness or excretory discharges
6	Guruta	Heaviness
7	Usha	Burning sensation
8	Toda	Pricking pain
9	Raga	Redness
10	Vartma Kosha Shoola	Pain in the around lids or fornices
11	Shookapurnabham	Foreign body sensation
12	Vihanya Aamana Rupa	Visual disturbances
13	Vihany Aamana Kriya	Improper functioning of the eye
14	Kriya Swakshi Yathapura	Reduced activities/movements e.g., blinking

Few of above *Poorvroopa* are also present in prodromal symptoms of EDE like:

- i. **Ashru-** Excessive watering due to irritation, dry eyes, decreased blinking, and foreign body sensation.
- ii. **Kandu-** Itching as a symptom because of eye strain.
- iii. **Upadeha-** Inflamed eyelids in MGD cause a crusty discharge at the base of the eyelashes.
- iv. **Vartma Kosha Shoola-** MGD may lead to eyelid inflammation, called blepharitis, especially along the rims which causes pain.
- v. **Usha, Toda-** Burning sensation and pricking pain in eyes due to reduced blinking, defective tear replenishment.

vi. **Sukapurnabham**—Foreign body sensation due to defective tear dynamics.

vii. **Vihanman Rupam-** Excessive screen time can make blurry vision and dry eye.

viii. **Kriya Swakshi Yathapura-** Due to pain and discomfort eyes reduced its activity and patient cannot open eyes for long.

#### ROOPA<sup>[17]</sup>

A disease's manifestation can be determined by its symptoms, or *Roopa*. The *Roopa* of *Shushkakshipaka* that is mentioned in many scriptures is as follows:

Table No: 04.

Roopa	Su.	A.H.	A.S.	M.N.	Karala	Y.R.	B.P
Koonita Vartma/Vikunana	+	+	+	+	+	+	+
Daruna ruksha vartma (Crusting of lids)	+	+	+	+		+	+
Avila/ Akula/ Anaccha darshanama	+	-	-	+	+	+	+
Sudarunamvata pratibodhane/ Kricchronmeela-nimeelanama	+	+	+	+	+	+	+
Gharsha (foreign body sensation)	-	+	+	-	-	-	-
Toda (pricking pain)	-	+	+	-	-	-	-
Bheda (tearing pain)	-	+	+	-	-	-	-
Updeha (mucoid discharge)	-	+	+	-	-	-	-
Vishushkatva (dryness)	-	+	+	-	-	-	-
Sheeteccha (liking for cold)	-	+	+	-	-	-	-
Shoola (crucifying pain)	-	+	+	-	-	-	-
Paka (Inflammation)	-	+	+	+	+	+	+
Daha (Burning sensation)	-	-	-	+	+	+	+
Khara Vartma (rough lids)	-	-	-	-	+	-	-

#### Upadrava<sup>[18]</sup>

Since *Shushkakshipaka* is one of the 18 diseases listed by *Acharya Vagbhatta* as having the potential to progress to chronic disease and is referred to as *Pilla Roga*, it can be inferred that *Shushkakshipaka* is one of those diseases.

#### CHIKITSA OF SHUSHKAKSHIPAKA

*Acharya Sushruta* has listed two key actions for the management of *Netra Rogas*:

##### 1. Samanya Chikitsa

a) **Nidana Parivarjana<sup>[19]</sup>**: Avoiding the disease's specific etiological causes means.

b) **Preventative measures**: For eyes, there is indication of *Triphala*, a calm mind, *Anjana*, *Nasya*, *Siravedhana*, eating bird flesh, prostrating before elders' feet, *Ghritapana*, *Padabhyanga*, having foot baths, using an umbrella, etc.

##### 2. Vishishta Chikitsa

###### a) Local actions

###### i. Anjana<sup>[20-25]</sup>

- *Rashkriya Anjana*- *Saindhava*, *Devdaru*, and *Shunthi* were plastered with water, *Ghrita*, and *Matulunga rasa*.

- *Saindhava*, *Shunthi*, and *Anoopa* and *Jalaja Vasa* were used to make *Anjana*.

- *Mahaushadha Anjana*.

- *Keshanjana* is made by rubbing human hairs with *Ghrita* on a mirror, then preparing *Masi* in a *Putapaka* and combining it with *Ghrita* in a *Lauhapatra*.

###### ii. Parisheka<sup>[26-27]</sup>

- Milk that has been *Saindhava Lavana* treated.
- *Saindhava Lavana* combined with cold water.

iii. **Nasya and Tarpana**: *Nasya* is accompanied by *Anu Taila* and *Jeevaniye Ghrita Tarpana*.<sup>[28]</sup>

iv. **Putpaka**: *Snehana Putpaka*

v. **Pindi**: *Vata-Pittaja* problems are advised for *Snigdha Pindi*.

vi. **Varti**: *Brihati*, *Eranda Moola Tavaka*, *Shigru-Moola*, and *Saindhava lavana* are all processed in *Aja ksheera* to make *Varti*.<sup>[29]</sup>

vii. **Aschyotana**: *Tikta-snigdha* and *Madhura-Sheetala Aschyotana* are indicated in *Vataja Netra rogas* and *Pittaja Netra rogas*, respectively. *Stree-Stanya Aschyotana* is recommended for eye diseases caused by *Rakta*, *Pitta*, and *Vata* vitiation.<sup>[30]</sup>

**b) Systemic actions****i. Ghritapana**

- The *Jeevaniye Ghritapana*
- *Ghrita* prepared from *Dugdha* and *Kulira Rasa*.

**ii. Vasti:** It is recommended to administer *Vasti* made from milk processed in *Madhuka*, *Shatahva*, and *Ghrita* supernatant.

**DRY EYE DISEASE**

Etiopathogenic classification of dry eye disease<sup>[31]</sup>:

**a. Aqueous tear deficient dry eye****b. Evaporative dry eye**

**Aqueous tear-deficient dry eye** implies that dry eye is due to a failure of lacrimal tear secretion. In any form of dry eye due to lacrimal acinar destruction or dysfunction, dryness results from reduced lacrimal tear secretion and volume.

ADDE can be divided into Sjögren's syndrome (SS) and non-SS.

**Evaporative dry eye** Evaporative dry eye results from increased evaporation from the tear film in the presence of a normally functioning lacrimal gland. Since the tear film lipid layer is the major barrier to evaporation from the ocular surface, it is not surprising that Meibomian gland dysfunction (MGD), which causes a deficiency of the tear film lipid layer, is the chief cause of EDE. But evaporation can also be increased by a prolonged blink interval or a widened palpebral aperture, so that these too may cause EDE.

**AETIOLOGY OF EDE<sup>[32]</sup>****Intrinsic Causes**

- Meibomian gland deficiency, e.g., posterior blepharitis, rosacea.
- Disorders of lid aperture, e.g., excessive scleral show, lid retraction, proptosis, facial nerve palsy.
- Low blink rate, e.g., Parkinson disease, prolonged computer monitor use, reading, watching television.
- Drug action, e.g., antihistamines, beta-blockers, antispasmodics, diuretics.

**Extrinsic causes**

- Vitamin A deficiency.

- Topical drugs including the effect of preservatives.
- Contact lens wear.
- Ocular surface disease such as allergic conjunctivitis.

**EPIDEMIOLOGY OF EDE**

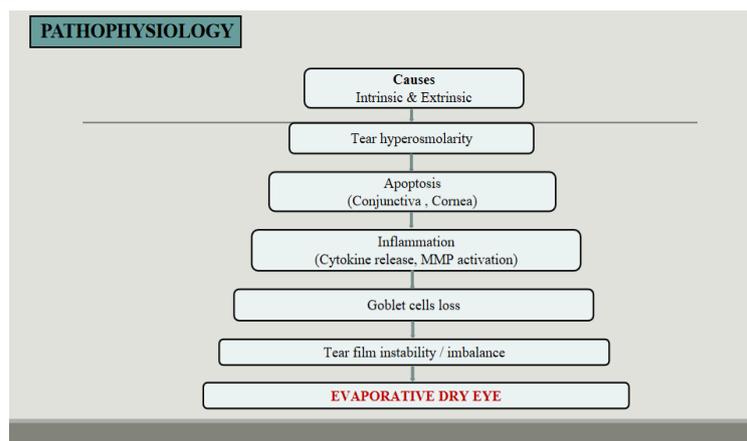
- 60 million people are affected by dry eye worldwide in which 1 to 2 million suffer from moderate to severe symptoms.<sup>[33]</sup> In India the overall prevalence of dry eye syndrome based on ocular surface disease index is 29.25%.<sup>[34]</sup>
- In a study by Nichols KK and Foulks GN 20.5% had dry eye disease caused by inadequate tear production, 35.5% had dry eye disease caused by tear film instability (evaporative) and 40% being mixed.<sup>[35]</sup>
- Asian studies on dry eye showed that the prevalence of dry eye is higher than that in western population and it is between 14.5% and 93.2%.<sup>[36]</sup>

**RISK FACTORS OF EDE<sup>[37-38]</sup>**

The Indian population, the majority of whom live with diabetes, dyslipidaemia, and other cardiovascular disorders, are at high risk of developing eye diseases. EDE is also very common among regular smokers, excessive visual display terminal users, and contact lens wearers. This disorder can also affect people who have hypothyroidism, rheumatoid arthritis, or who take anti-allergic, anti-hypertensive, anti-depressant, or topical anti-glaucoma medications.

**PATHOPHYSIOLOGY OF EDE<sup>[39]</sup>**

A major contribution of the TFOS DEWS report was the proposition that every kind of dry eye, however initiated, enters a final common pathway in which tear hyperosmolarity and a chain of inflammatory events creates a Vicious Circle that perpetuates the DED state. In the simplest model of DED, with tear hyperosmolarity as its the starting point, the pathological process is propagated by a chain of events that lead to ocular surface damage. This may be summarised as follows:



**CLINICAL FEATURES<sup>[40]</sup>****Symptoms**

EDE is asymptomatic in early stages. On progression, patient may have complaints of burning sensation, foreign body/gritty sensation, itching, irritation or dryness in eyes, photophobia, transient blurring of vision, excessive stringy mucous and red and inflamed eyelid may be seen.

**Signs****Meibomian glands**

- Blocked meibomian gland openings/ meibomian orifice plugging
- Discharge on squeezing glands
- Eyelid margin foaming
- Hyperaemia/telangiectasia in eyelid margin

**Conjunctiva**

- Conjunctival hyperaemia
- Staining with rose Bengal and lissamine green

**Tear film**

- In dry eyes, lipid-contaminated mucin builds up as particles and debris in the tear film, which migrate with each blink.
- The marginal tear meniscus (strip) is a crude measure of the volume of aqueous in the tear film. In the normal eye the meniscus is 0.2-0.4 mm in height, but in dry eye becomes thin (less than 0.25 mm) or absent.

**Cornea**

- Punctate epithelial erosions that stain well with fluorescein.
- Filaments are normally attached to the corneal surface at one end, and are made up of strands of mucus and debris, such as shed epithelial cells. The filaments stain well with rose Bengal.

**DIAGNOSIS OF EDE<sup>[41]</sup>****A. Detailed history taking****B. Questionnaires**

- Ocular Surface Disease Index (OSDI) questionnaire
- SANDE questionnaire
- DEQ-5 questionnaire

**C. Clinical examination and Tests:** the tests measure the following parameters<sup>[42]</sup>**1. Tear Volume Assessment**

- Tear meniscus height (meniscometry)
- Schirmer test
- Phenol red thread test

**2. Assessment for Tear Film Composition**

- Tear osmolarity
- Tear film ferning

**3. Tear Clearance Assessment**

- Tear Clearance Test

- Fluorescein Clearance
- Tear Film Index (TFI)

**4. Tear Film Stability Assessment**

- Tear film break up time
- Invasive Tear break up time
- Non-invasive Tear break up time
- Tear Evaporation Rate

**5. Ocular Surface Damage Assessment**

- Ocular Surface Staining
- Impression Cytology

**6. Test for the diagnosis of MGD**

- Volume of expressed meibum
- Viscosity of expressed meibum

**MANAGEMENT OF EDE<sup>[43]</sup>****Patient counselling**

Patient should be counsel or educated about lifestyle modification and preventive measures that include behavioural changes like:

- Try to avoid smoke, wind, and air conditioning
- Use a humidifier to keep the air in home from getting too dry
- Limit screen time and take breaks from staring at screens
- Wear wraparound sunglasses when outside
- Drink plenty of water — try for 8 to 10 glasses every day
- Get enough sleep — about 7 to 8 hours a night
- Maintain Eyelid hygiene.

**Treatment based upon the sign and symptoms<sup>[44]</sup>**

- Ocular lubricants are a staple of therapy; however, they typically only alleviate symptoms for a short period of time and do not address the underlying pathology e.g., CMC 1%, Trehalos, Xanthan gum, Hyaluronic acid 0.4-0.5%, Carbopol etc. Polymer cellulose such as Carboxymethyl cellulose (CMC), Hydroxy propyl methyl cellulose (HPMC) are the commonly used lubricants.
- Hyaluronic acid-containing polymers are regarded as the gold standard for improving tear film stability.
- If there is clinical evidence of inflammation, it is recommended to start therapy with a corticosteroid plus cyclosporine to stop the generation of proinflammatory chemicals and get a quick response.
- For patients with a significant component of EDE and MGD, procedures targeting clearance of Meibomian gland obstructions can be employed using:
  - **Heat or mechanical energy**
  - **Eye-warming devices**
  - **Intraductal meibomian gland probing** to restore natural flow of meibum
  - **Topical and systemic antibiotics** (tetracyclines, macrolides, fluoroquinolones).

**COMPLICATIONS<sup>[45]</sup>**

Untreated EDE can be vision threatening and include epithelial breakdown, melting, perforation and other lid disorders and corneal diseases such as anterior blepharitis, phlyctenular keratitis, superficial punctate keratitis etc.

**CONCLUSION**

The eye is a specialized sensory organ that performs the most essential task of giving living things sight. Everything is lost if vision is gone. Even if he is wealthy, a blind guy cannot enjoy life. Evaporative DED affects tens of millions of individuals all over the world. In the global information age with overwhelming development of digital devices, working related to visual display terminals (VDT) is increasing dramatically, which is also accompanied by a higher incidence of health problems, such as ocular discomfort. When people have problems with daily life due to dry eye, they have less participation in daily activities. This limitation inactivity leads to a decrease in the quality of life, which can lead to social withdrawal and emotional strain. Several contributory factors affect the severity of dry eye including autoimmune disease, environmental surrounding, contact lens use, hormonal changes, anatomical features, chronic inflammation, infection, and iatrogenic factors such as medications and surgeries. If the disease is left uncured it may lead to many serious complications like corneal abrasions, corneal ulcers and may also lead to blindness so, early diagnosis and treatment are therefore important. The modern treatment modalities of Dry eye syndrome consist of warm compresses, lid massage, improved eyelid hygiene for removing obstructed meibum, lipiflow thermal pulsation system, intense pulsed light therapy, artificial tears, topical antibiotics, anti-inflammatory agents, Vit A, C and E rich food supplements and omega-3. However, these may cause adverse effects, including reduction of the desired effects, allergic response, and toxic reactions on long term use. Moreover, it needs lifelong treatment modalities. *Acharyas* have described different forms of treatment for *Shushkakshipaka* in Ayurvedic texts; these include topical medications like *Ksheeraseka*, *Ashchyotana*, *Tarpana*, *Snehana Putapaka*, *Snehana Anjana*, etc. as well as systemic drugs like *Nasya*, *Vasti*, *Rasayana*, etc. when used promptly provides objective proof of outstanding responses. With a systemic and comprehensive approach to treating *Shushkakshipaka*, and using topical and local therapeutic measures, the condition could be effectively treated.

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