THE EFFICACY OF GOGHRUTA ASCHOTANA IN COMPUTER VISION SYNDORME

A THESIS SUBMITTED TO

BHARATI VIDYAPEETH UNIVERSITY, PUNE

FOR AWARD OF DEGREE OF

DOCTOR OF PHILOSOPHY IN SHALAKYATANTRA

UNDER THE FACULTY OF AYURVED

SUBMITTED BY

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CERTIFICATE

This is to certify that the work incorporated in the thesis entitled "The Efficacy Of Goghruta Aschotana In Computer Vision Syndorme" for the degree of 'Doctor of Philosophy' in the subject of Shalakyatantra under the faculty of Ayurved has been carried out by Dr. Mr. Santosh Shivaji Mulik in the Department of Shalakyatantra at Bharati Vidyapeeth Deemed University, College of Ayurved, Pune during the period from August 2010 to July 2015 under the guidance of Dr. Dilip B. Bhusari.

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CERTIFICATION OF GUIDE

This is to certify that the work incorporated in the thesis entitled "The Efficacy Of Goghruta Aschotana In Computer Vision Syndorme" submitted by Dr. Mr. Santosh Shivaji Mulik for the degree of 'Doctor of Philosophy' in the subject of Shalakyatantra under the faculty of Ayurved has been carried out in the Department of Shalakyatantra, Bharati Vidyapeeth Deemed University, College of Ayurved, Pune during the period from August 2010 to July 2015 under my guidance.

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DECLARATION

I hereby declare that the thesis entitled "The Efficacy Of Goghruta Aschotana In Computer Vision Syndorme" submitted by me to the Bharati Vidyapeeth University, Pune for the degree of **Doctor of Philosophy (Ph. D.)** in **Shalakyatantra** under the **Faculty of Ayurved** is original piece of work carried out by me under the supervision of **Dr. Dilip B. Bhusari**. I further declare that it has not been submitted to this or any other University or Institution for the award of any Degree or Diploma.

I also confirm that all the material which I have borrowed from other sources and incorporated in this thesis is dully acknowledged. If any material is not dully acknowledged and found incorporated in this thesis, it is entirely my responsibility. I am fully aware of the implications of any such act which might have been committed by me advertently or inadvertently.

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KEY TO TRANSLITERATION

अ	a, A	क्	k K	ट	ṭa	भ	Bha
आ	ā, Ā	क	Ka	ठ	ṭha	म	Ma
इ	i, I	ख्	Kh	ड	ḍa	य	ya
ई	Ī, Ī	ख	Kha	ढ	ḍha	र	Ra
उ	u, U	ग्	g	ण	ṇ Ṇ	ल	La
ऊ	ū, Ū	ग	ga	त	ta	व	Va
ऋ	ṛ ,Ṛ	घ	gha	थ	tha	श	Śa
ए	e, E	ङ	ṅa, Ṅa	द	da	ष	Ṣa
ऐ	ai, Ai	च	Ca	ध	dha	स	Sa
ओ	o, O	छ	Cha	न	na	ह	Ha
औ	au, Au	ज	ja	प	pa	क्ष	kṣa
अं	ṃ, Ṃ	झ	jha	फ	pha	त्र	Tra
अः	aḥ ,AḤ	ञ	ña, Ña	ब	ba	ज्ञ	Jña

ABBREVIATIONS

Suṣruta Saṃhita Uttarataṃtra	सु.उ.	Computer Vision Syndrome	**C.V.S.**
Suṣruta Sūtrasthāna	सु. सु.	Tear Film Break Up Time	**T.F.B.U.T.**
Aṣṭaṃga Saṃgraha Uttartaṃtra	अ.सं.उ.	Schirmer Test	**S.T.**
Vāgbhata Sūtrasthān	वा.सू.	Hydroxy Propyl Methyl Cellulose	**H.P.M.C.**
Yogratnākar	यो.र	Antireflection Coating	**A.R.C.**
Nighantu Ratnakar	नि.र.		

INTRODUCTION

INTRODUCTION

Eyes were greatly valued by ancient Indians & prime importance has been given for the protection of eyes. Manu says in his scripture that out of five senses, eye is considered as most precious organ. It is like the sun in the sky. Ācarya Vāgbhata says that as long as there is desire for living, so long all efforts should be made always by men to protect the eyes; because for the blind man, night and day are the same; all the things of this world are useless though he might have plenty of money.

In this present era, the human life style has been drastically changed. The human eye was designed for more of distance work and we sailed through centuries with minimal difficulties as the eyes could adapt to the changes in our near tasks. Computers are now an integral part of our day. The advancement in computer science has brought about a vast change in our lives that we can't think computer less life.

Before the involution of computers, office work had involved various activities including typing, filing, reading, and writing. These activities require variety of changes in posture and vision, giving a natural "break" from the previous activity. A computer has combined these tasks to where most can be performed without moving from the desktop, this improves quality, production, and efficiency. In fact, it is estimated that the 75% of all jobs in the year 2000 involved computer usage.

The transformation from working in the open to working on paper has been gradual and not very stressful for our visual system. But the shift from papers to computers has been very rapid and strong. Eye could not adapt to the new demands put on it to work at near in front of computers for extensive hours and in extremely stressful environments. Inspite of these benefits user confront new problems at their work places. Because of working long hours in front of computer, vision and ophthalmic symptoms may develop. These have been collectively called as Computer Vision Syndrome (CVS).

According to national institute of occupational safety and health, CVS affects some 90% of the people who spent three hours or more a day on a computer. Computer users vision related problems are the most frequently reported health-related problems occurring in over 70% of computer users.[1] They have concluded that CVS is a vision disorder that has been described as the number one occupational hazard of 21st century. Previous studies have estimated that the prevalence of CVS ranges between 64 and 90% among computer users.[2]

It has been estimated that nearly 60 million people suffer from CVS globally and about one million new cases occur each year.[3]

Asthenopic symptoms in eye are responsible for much of the morbidity in CVS. Proper rest to its muscles is recommended to relieve the associated eye strain. A routinely recommended approach is to consciously blink eyes now and then. (This help to replenish the tear film) and look out the window to distant object or to the sky. Doing so provides rest to the cilliary muscles. One of the catch phrases is "20-20-20". After every 20 minutes focus the eye on an object 20 feet away for 20 seconds.

According to modern medical science, artificial tear drops are useful in Computer Vision Syndrome. Dry eye is a major symptom that is targeted in therapy of CVS. The use of artificial tear drops can reduce the effects of dry eye in CVS.

Anti-reflection coating improves both vision through your lenses and the appearance of your eyeglasses. ARC coating eliminates the reflection of light from the front and back surface of eyeglasses. Todays modern antireflective coatings can virtually eliminate the reflection of light from eye glasses allowing 99.5% entry of light in eye. So ARC coating glasses are also useful in Computer Vision Syndrome.

Many American's are unaware of the benefits of anti-reflection coating. In Japan over 80% of eyeglasses lenses includes ARC coating. In most European countries over 50% of eyeglasses include ARC coated lenses. Yet in United States less than 25% of eyeglass lenses have ARC coating applied.

But these artificial tear drops and ARC coating glasses have their own limitations and so no satisfactory treatment is available for Computer Vision Syndrome.

Computer vision syndrome is somewhat related to the Śuṣkākṣipāka in Āyurveda. Śuṣkākṣipāka is Vātpittajanya Vyādīi. According to Āyurveda, Goghṛuta is Vāta pittaghna. It has the quality of Snigdha (oiliness). It is smooth, lubricating and nurturing. As there is no satisfactory treatment available for computer vision syndrome, Āyurveda, the ancient science of life can be of great help by its preventive and therapeutic principals.

To address this issue, I have chosen to perform clinical trials in Computer Vision Syndrome with Āyurvedic drug. The main objective of this study to find out a suitable preventive substance which has the ability not only to prevent the progressive damage but also to cure the condition.

In Āyurvedic Samhitas, different types of advices and procedures such as Kriyākalpas are suggested. Also eye care medicaments Śamana auṣadīs, Cakṣuṣya dravya and Rasāyanas etc are prescribed to preserve the vision, improve the hemostasis, ocular strength and to cure the eye diseases. In Śuṣkākṣipāka 'Vāta Doṣa' is considered as prime factor so Śuṣkatā is the main symptom. Hence treatment must be strictly aimed to arrest the vitiated Vāta Doṣa in the eye.

Aścotana is one of the Kriyākalpas described in Āyurveda. In Aścotana procedure Ācarya have described use of snigdha and madhur rasātmaka dravya in Vātapittajanya Vyādhī. As Goghṛuta is vatta pittaghana, Cakṣuṣya and having properties of snigdha guṇa and is easily available. Goghṛuta was chosen for this clinical trial because

- Goghṛuta is used as a base for various formulations which have been extensively used for various eye diseases. So it is relatively safe than other Āyurvedic preparations.
- It is used for both local and internal administration in many forms for treating many of the ocular conditions.
- It acts as the best Rasāyana and Cakṣuṣya drug.
- Goghṛuta is also Rasāyana and Netrabalakāraka.
- Aścotana is the simplest and most convenient method of topical application. Application in form of eye drops makes the drug available for immediate use.

So, I have selected this topic in order to study the effect of Goghṛuta Aścotana in Computer Vision Syndrome.

AIM AND OBJECTIVES

AIM OF THE RESEARCH WORK

The efficacy of Goghṛuta Aścotana in Computer Vision Syndrome.

RESEARCH OBJECTIVES

- To study the Computer Vision Syndrome in detail.
- To study Goghṛuta in detail.
- To evaluate effect of Goghṛuta Aścotana in Computer Vision Syndrome.
- To compare effect of Goghṛuta Aścotana & Moisol eye drop & Anti reflection coating glasses in Computer Vision Syndrome.

REVIEW OF LITERATURE

1. **Review of Modern literature**
2. **Review of Ayurved literature**

REVIEW OF MODERN LITERATURE

Anatomy of Eyeball

It is situated in the bony orbit slightly anteriorly and on superiomedial side and the space in between is filled up by fatty tissue. Thus it is protected from any external injury.

Dimensions of eyeball are:-

- Anteroposteriorly:- 24 mm
- Horizontally:- 23.5 mm
- Vertically:- 23 mm

Eyeball is made up of three different coats:-

1. **Outer fibrous coat:-** It consists of sclera and cornea. The function of fibrous coat is to protect the inner delicate structures of the eyeball.

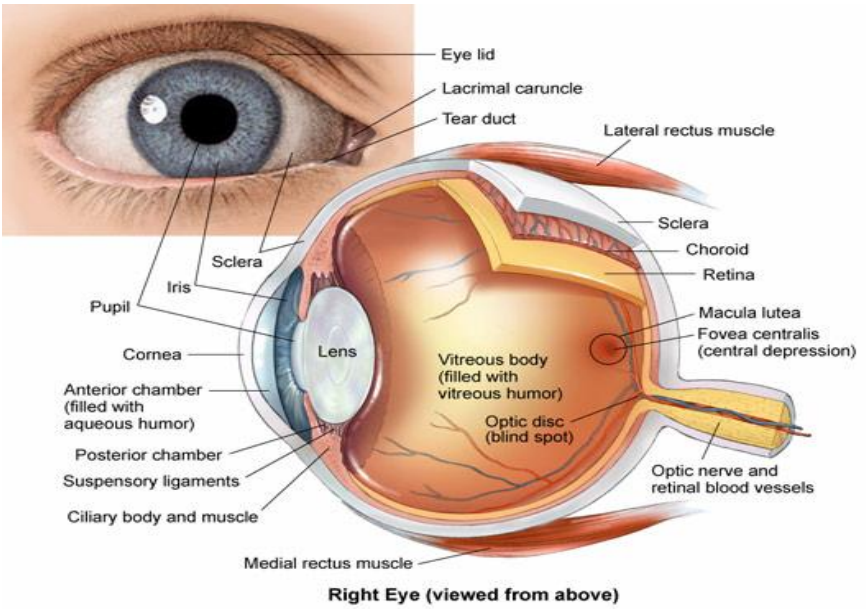
2. **Middle or vascular coat:-** It consists of iris, cilliary body and choroid. The vascular coat contains mostly the blood vessels which supply nutrition to various ocular structures.

3. **Inner or nervous coat:-** It consists of retina and optic nerve. It plays an important role in visualizing the objects. It is concerned in reception and transformation of light stimulus.

Contents of Eyeball:-

- Aqueous humor
- Lens
- Vitreous humor

Figure 1- Anatomy of Eye ball



Ocular Appendages:-

The ocular adnexa or ocular appendages comprise eyelids, orbit, extraocular muscles, the conjunctiva and the lacrimal apparatus.

Anatomy of Lacrimal Apparatus

The lacrimal system comprises structures involved in the production and drainage of tears. The secretory component consists of the lacrimal glands which are exocrine glands that produce the various ingredients of tear fluid, which is distributed over the surface of the eye by the action of blinking. The puncta, canaliculi, lacrimal sacs, and nasolacrimal ducts form the excretory elements of the system, secretions ultimately draining into the inferior meatus of the nose.

Anatomy of Main Lacrimal Gland-:

It is situated in the anterior and outer part of the roof of the orbit which forms the concavity known as the fossa of the lacrimal gland. It is in direct contact with the upper and outer side of the eyeball.

Anatomically it has 2 parts-:

1. Orbital part
2. Palpebral part

They are incompletely separated by levator palpebral muscle. Orbital portion is bigger than palpebral portion. The anterior portion of the palpebral part can be seen through the conjunctiva in the lateral portion of the superior fornix. 10 to 12 ducts from both portions open into the conjunctival sac just in front of the fornix. Few ducts open into the lateral portion of the inferior fornix also. The ducts from the orbital portion pass through the palpebral portion and hence, removal of the palpebral portion might result in loss of secretion of lacrimal fluid.

Accessory lacrimal glands[4]-:

1. Glands of Krause: These are microscopic glands lying beneath the palpebral conjunctiva between fornix and the edge of tarsus. These are about 42 in the upper fornix and 6-8 in the lower fornix.

2. Glands of Wolfring: These are present near the upper border of the superior tarsal plate and along the lower border of inferior tarsus.

Structure:

All lacrimal glands are serous acini, similar in structure to the parotid glands. Microscopically these consist of acini which consists of two layers of cells outer myoepithelial and inner layer of cylindrical cell which are secretory in nature.

Blood supply:

Main lacrimal gland is supplied by lacrimal artery which is a branch of ophthalmic artery. Venous drainage is into the ophthalmic vein.

Nerve supply:

1. Sensory supply comes from lacrimal nerve, a branch of the ophthalmic division of the fifth nerve.
2. Sympathetic supply comes from the carotid plexus of the cervical sympathetic chain.
3. Secretomotor fibres are derived from the superior salivary nucleus.

Lacrimal passages[5]

1. Lacrimal puncta: These are two small, rounded or oval openings near posterior border of upper and lower lids, about 6mm temporal to the inner canthus. Each punctum is situated upon a slight elevation called lacrimal papilla which becomes prominent in old age. Normally the puncta dip into the lacus lacrimalis (collection of tear fluid in the inner canthus). The puncta are visible only after slightly everting the eyelids.

2. Lacrimal canaliculi: These join the puncta to the lacrimal sac. Upper canaliculus 8mm and lower one is 8.5mm long. First 2mm of canaliculus is vertical and rest of the horizontal which converge medially to unite and the common canaliculus open into the middle of lateral surface of the lacrimal sac. A fold of mucosa at this point forms the valve of Rosenmuller which prevents reflux of tears.

3. Lacrimal sac: It lies in the lacrimal fossa located in the anterior part of medial orbital wall. The lacrimal fossa is formed by lacrimal bone and frontal process of maxilla. It is bounded by anterior and posterior lacrimal crests. When distended,

lacrimal sac is about 1.5 mm in length and 5-6 mm in breadth. It has got three parts: fundus (portion above the opening of canaliculi), body (middle part) and the neck (lower small part which is narrow and continuous with the nasolacrimal duct). The sac is enclosed by a portion of periorbita known as the lacrimal fascia which splits at the anterior and posterior lacrimal crests. Few fibres of Muller's muscle take origin from posterior lacrimal crest. Anteriorly, the upper part of the sac is in close contact with the medial palpebral ligament to which crosses the angular vein 8mm from inner canthus.

4. Nasolacrimal duct (NLD): It extends from neck of the lacrimal sac to inferior meatus of the nose. It is about 15- 18 mm long and lies in a bony canal formed by the maxilla and the inferior turbinate. Direction of the NLD is downwards, backwards and laterally. Externally its location is represented by a line joining inner canthus to the ala of nose. The upper end of the NLD is the narrowest part. There are numerous membranous valves in the NLD, the most important is the valve of Hasner, which is present at the lower end of the duct and prevents reflux from the nose.

Anatomy of glands of Eyelids [6]–

1. **Meibomian glands :** These are also known as tarsal glands and are present in the stroma of tarsal plate arranged vertically. They are modified sebaceous glands. Their ducts open at the lid margin. Their secretions constitutes the only layer (lipid layer) of the tear film.
2. **Glands of Zeis :** These are also sebaceous glands which open into the follicles of eye lashes.
3. **Glands of Moll :** These are modified sweat glands situated near the lash follicles, the ducts of which opens either into a lash follicle or directly into the anterior lid margin between the lashes. They do not open directly onto the skin surface as elsewhere.

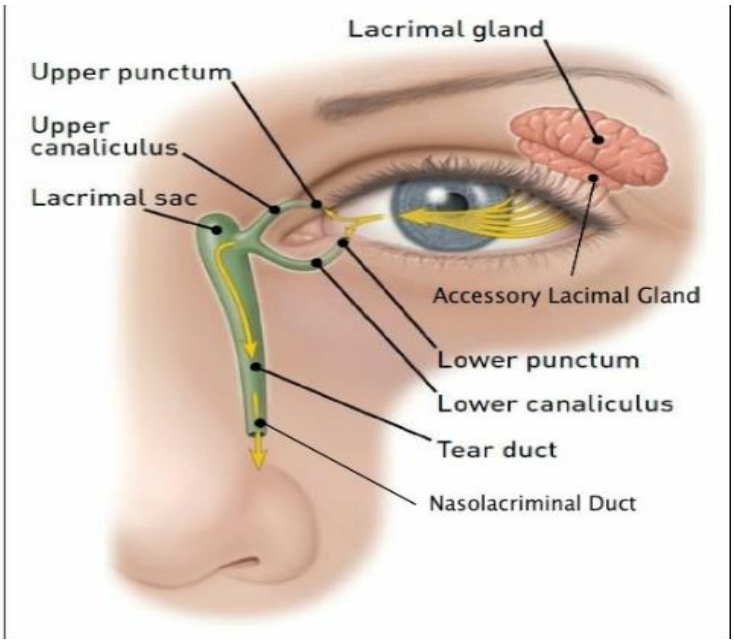
Secretion of tears :

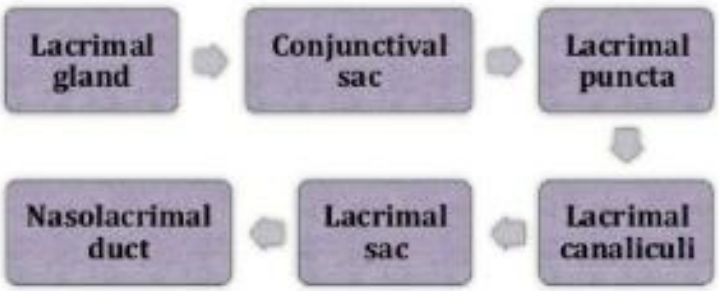
Tears are continuously secreted throughout the day by accessory (basal secretion) and main (reflex secretion) lacrimal glands. Reflex secretion is in response to sensations from the cornea and conjunctiva, probably produced by evaporation and break-up of tear film. Hyperlacrimation occurs due to irritative sensations from the cornea and conjunctiva. Afferent pathway of this secretion is formed by fifth nerve and efferent by parasympathetic (secretomotor) supply of lacrimal gland.

Elimination of tears:

Tears flow downward and medially across the surface of eyeball to reach the lower fornix and then via lacus lacrimalis in the inner canthus. From where they are drained by lacrimal passages into the nasal cavity. This is brought about by an active lacrimal pump mechanism constituted by fibres of the orbicularis (especially Horner's muscle) which are inserted on the lacrimal sac. When the eye lids close during blink, contraction of these fibres distends the fundus of the sac, creates therein a negative pressure which syphons the tears through punctum and canaliculi into the sac. When the eyelids open, the Horner's muscle relaxes, the lacrimal sac collapses and a positive pressure is created which forces the tears down the nasolacrimal duct into the nose. Therefore, in atonia of sac, tears are not drained through the lacrimal passages, in spite of anatomical patency; resulting in epiphora.

Figure 2-Anatomy of Lacrimal Apparatus





Physiology of Tear Film[7]

The presence of the pre-corneal tear film was 1st demonstrated by Fischer in 1928. Tears wet the front of the eye and extend under the eyelids. The thin layer of tears that cover the exposed area of the globe are capped with an oily layer, and it referred to as tear film. It is essential for maintaining the transparency of cornea. It provides smooth optical surface, acts to supply nutrients and helps to protect the eye against environmental conditions.

Wolff was the first to describe the detailed structure of the fluid covering the cornea and called it precorneal film. It consists of three layers from outer layer to inner layer are-:

1. Lipid Layer (0.1 mm Thick)
2. Aqueous Layer (7-10 mm Thick)
3. Mucinous Layer (0.2-1.0 mm Thick)

1) Lipid Layer-:

The most superficial layer of the tear film is produced by the meibomian glands in the tarsal plate, which secrete sebaceous material at the mucocutaneous junction of the lid margin. Blinking compresses and stretches this secretion over the tear film to create and maintain the superficial oily layer which has a major role in retarding evaporation from the tear film. The lipid layer prevents tear spillage from the ocular surface, prevents eyelid skin damage by tears, and forms a protective seal over the ocular surface during sleep. The functions of stabilizing the ocular surface by preventing evaporation and enhancing the solubility of tear components have also been proposed.

2) Aqueous Layer-:

The aqueous layer is secreted by the main and accessory lacrimal glands. It constitutes the largest volume of the tear film. it rests above the mucin but deep to the lipid layer. the aqueous layer consists primarily of water but also contains electrolytes (Na, K, Cl) and myriad proteins, including epidermal growth factor, immunoglobulins (IgA, IgG, IgM),

lactoferrin, lysozyme, and other cytokines. The precise role of these proteins is unknown, but they likely play both a protective and a homeostatic role for the ocular surface.

3) Mucin Layer-:

The mucin layer consists of high–molecular-weight glycoproteins that adhere to surface epithelium and its secreted glycocalyx. This mucinous coating of the hydrophobic epithelial cell surface provides a level, hydrophilic surface, permitting smooth distribution of the overlying aqueous layer. It is primarily secretes by conjunctival goblet cell

Figure 3- Components of Tear film

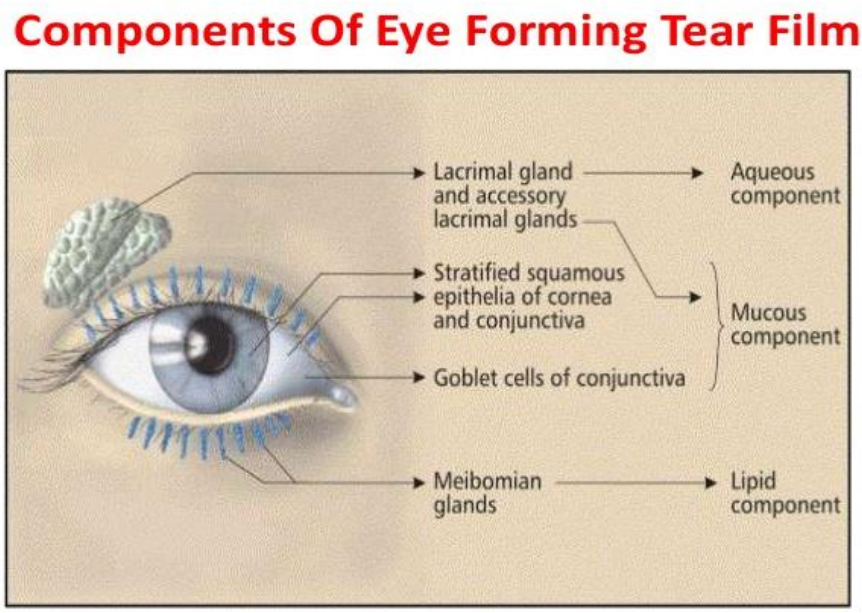
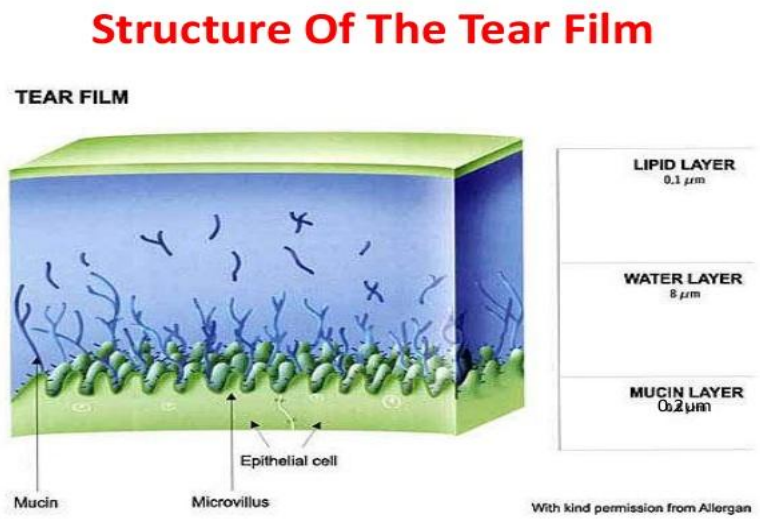


Figure 4 - Structure of Tear film



1. Physical properties of tear film :

Tear fluid is clear, salty, slightly alkaline and watery.

1. Thickness of tear film - Average volume of tear film varies from 4 um to 8 um.
2. Volume of tear film :- The average volume of tear film has been reported to be 7 ul with a range from 4-13 ul (one to two drops) during basal condition.
3. Rate of tear secretion – 12 ul per min.
4. Refractive index – Refractive index of tear film is 1.357.
5. pH of tears – The pH of tears is nearly 7.4, pH of tears is lowest on awakening due to acid by products associated with relatively anaerobic conditions in pro longed lid closure.
6. Osmotic pressure – the osmotic pressure of the tear film in normal eye is equivalent to 0.90% to 0.95% NaCl solution.
7. Temperature of tear film – It ranges from 35^0C at a limbus to a low of 30^0C at the centre of cornea.

   It varies with extremely cold or hot environment, under windy conditions and with the eyelids tightly closed or held open for prolonged period of time.

8. Oxygen tension (PO_2) – In the normal tear film, under basal condition PO_2 varies from 40 – 160 mmHg under a tightly fitting contact lens it may drop to a value as low as 20 mm Hg with a well fitted contact lens a more normal PO2 is retained during blinking as the tidal flow of tears changes beneath the lens.

2. Ion Composition –

The ion composition of the tear fluid is the another challenges. The concentration of potassium ions 17.0 mmol/L is important for cornea. "Sodium biacrabonate is the physiological buffer system of the tear fluid and is very important for the cornea.

Defects in the epithelium heal considerably faster in the presence of sodium bicarbonate.

Figure 5-Chemical Composition Of Tear Film

Chemical Composition Of Human Tears & Plasma

	TEARS	PLASMA
1)water	98.2g%	94g%
2)solids, total	**1.8%**	**6g%**
3)Na+	142meq/l	137-142meq/l
4)K+	**15-29meq/l**	**5meq/l**
5)Cl-	**120-135meq/l**	**102meq/l**
6)HCO3-	26meq/l	24.3meq/l
7)Ca2+	2.29mg/100ml	
8)Glucose	*3-10mg/100ml*	*80-90mg/100ml*
9)Total proteins	*0.6-2gm/100ml*	*6.78g/100ml*
10)Aminoacids	8gm/100ml	
11)Urea	*0.04mg/100ml*	*20-40mg/100ml*

Functions of Tear film

1) To form an almost smooth optical surface on the cornea by filling in and smoothening out small surface irregularities in the corneal epithelium.

2) Keep the surface of cornea and conjunctiva moist.

3) Serves as a lubricant for the preocular surface and lids.

4) It transfers oxygen from ambient air to the cornea.

5) It prevents infection due to presence of antibacterial substances like lysozyme, betalysin, lactoferrin, immunoglobulins and other proteins.

6) Washes away debris and noxious irritants.

7) It provides refractive media for light.

8) It provides a pathway for white blood cells in case of injury.

Regulation of tear film components –

1. Hormonal : Androgens are the prime hormones that regulate lipid production. Oestrogens and progesterone receptors in the conjunctiva and the lacrimal glands are essential for normal function of these tissues.

2. Neural : Fibres adjacent to the lacrimal glands and goblet cells result in aqueous and mucus secretion.

COMPUTER VISION SYNDORME

INTRODUCTION

Computer Vision Syndrome is the complex of eye and vision problems related to near work which are experienced during or related to the computer use. CVS is characterized by visual symptoms which result from interaction with a computer display or its environment.

It is caused by extensive use of computers which reduces the blinking rate of a person and due to this water flow across the eyes is reduced drastically and leads to dryness.

In most cases, symptoms occur because the visual demands of the task exceed the visual abilities of the individual to comfortably perform the task.

The main ocular symptoms reported are dryness, eye strain, watering, hedache, irritation, redness, blurred vision, diminished vision and may double vision.

Definition[8]

The American Optometric Association defines CVS as that "Complex of eye and vision problems related to near work that are experienced during or related to computer use.

Technically CVS is not a true syndrome in the medical sense. It is series of symptoms that are common to those who experience Computer related eye discomfort.

Both visual and ophthalmic symptoms occur among computer users. These have collectively been called the computer vision syndrome (CVS). Visual complaints include blurred vision and the need for eyeglasses. Ocular symptoms associated with the syndrome include Dryness, Redness, Burning, Eye fatigue & Itching.

Frequency

A large percentage of computer users have ocular symptomatology and, thus, seek eye examinations. According to Thompson, the prevalence of ocular symptoms in computer users, as part of the syndrome, ranges from 25-93%.Studies by Sheedy and coworkers suggest that 1 out of 6 patients requiring eye examinations have a computer-related eye problem.

ETIOLOGY

The etiology of computer vision syndrome (CVS) is multifactorial, as several issues may lead computer users to this syndrome. These factors may be environmental, personal, or a combination of both.

Causes :

Personal factors are as follows:

- Age and sex: Previous studies have shown that female patients, as compared to male patients, tend to have a reduction in the tear film's aqueous layer with increasing age.
- Uncorrected refractive errors may lead to blurred vision, asthenopia, eye fatigue, and headaches. Even though presbyopes may wear bifocals, computer users who wear bifocals may have to extend their neck to focus on the monitor, reading material, and/or the keyboard, which are usually located at intermediate distances. Neck extension for prolonged periods of time may also lead to neck pain and headaches as part of the syndrome.
- Symptoms associated with this syndrome, such as burning sensation of the eyes, may be exacerbated in computer users with preexisting dry eyes.
- Diseases that widen the interpalpebral fissures or lead to lid retraction, such as thyroid disease, may lead to increased tear evaporation. Normally, patients tend to blink approximately 18 times per minute. Patel and coworkers showed that computer users blinked only 4 times per minute. A reduced blinking rate in computer users may be part of an effort to gaze attentively at the computer monitor.
- Diminished blinking may worsen Meibomian gland dysfunction and, thus, symptomatology in patients with the CVS.

Environmental factors are as follows:

- A large angle of gaze, low humidity, and excess room illumination, may exacerbate ophthalmic symptoms associated with the syndrome.
- Computer users open their interpalpebral fissures to look at their monitors, as opposed to office clerks who look downward at their desktops. Therefore,

computer users have more eye surface exposure to environmental factors, which may lead to increased tear evaporation.

- When the monitor's center is positioned higher than the canthal region, both the angle of gaze needed to look at the monitor and the interpalpebral aperture are wider. On the other hand, when the monitor's center is lower than the canthal region, both the angle of gaze needed to look at the monitor and the interpalpebral aperture is smaller.
- A rule of thumb would be to advise patients that the top or their monitors should be lower than their eyebrows.
- Sheedy and coworkers believe that light sensitivity is worst in computer users, as compared to other office clerks, since computer users keep their eyes wide open to look at the monitor. Many patients with CVS complain of light sensitivity, which is worsened by high wattage fluorescent or flickering lights at the workplace. Computer users may have discomfort and glare from overhead fluorescent lights and large glass windows that are close to their workstations. Personal factors may also exacerbate the symptoms associated with CVS.

  Combined factors are as follows:
- Computer users who are presbyopic may need to extend their neck to look at the monitor through the bifocals. Systemic symptomatology may be exacerbated further by having an upward gaze to look at the computer's monitor.

Figure-6 PATHOGENESIS OF CVS[9]

Images on Computer screens

Contrast is not sharp, edges of characters are not well defined

Eyes have difficulty focusing

Eyestrain to Regain Focus

Puts Strain On Cilliary muscles of the Eye

Eye Fatigue & Headache

Dry Eyes , Burning sensation & Redness from reduced blinking

Repeated head posture change/Wrong Posture

Strain on the neck muscles and cervical spine

Neck pain & Hedache

CLINICAL PRESENTATION

History :

The patient's history should be obtained, including age, chief complaint, and onset of symptoms.

- In obtaining a history of present illness, the ocular symptoms should be evaluated. Patients with computer vision syndrome (CVS) complain of several symptoms, such as blurred vision, dryness, burning sensation, itching, red eyes, tearing, and photophobia.
- Previous eyeglasses prescriptions and eye medications, including lubricants, should be evaluated.
- The review of systems may include such issues as xerostomia, thyroid disease, menopause, arthritis, carpal tunnel syndrome, Parkinson disease, and systemic medication use that may exacerbate dry eye symptoms (eg, anticholinergics, antihistamines, antidepressants, diuretics).
- Environmental factors, such as computer setup, seating, wrist position, monitor type, desktop color, window proximity, and ceiling and desk illumination sources, should be evaluated.

Physical :

Patients with CVS should undergo a comprehensive ophthalmic evaluation that includes the following:

- Best-corrected visual acuity for near, intermediate, and distance vision
- Manifest refraction at near, intermediate, and distance for refractive errors since computer users may have refractive errors, including presbyopia.
- A cycloplegic refraction is of utmost importance in the younger population (<21 y) because young computer users may have refractive errors, particularly latent hyperopia, that will lead to visual symptoms as part of the syndrome.
- A slit lamp examination to evaluate tear meniscus and corneal staining
    - Patients with this syndrome may have superficial punctate keratitis.
    - The lens should be evaluated for cataract formation.
- Intraocular pressure should be monitored.
- A fundus examination to examine optic nerve, vessels, macula, and peripheral retina is needed.
- A Schirmer test & Tear Film Break up Time is needed to assess for dry eye.

Work Up :

Lab studies :

Tear electrophores may be used when available as a tool for the diagnosis of tear film impairment in high-risk groups such as computer users.

A hormonal evaluation, such as a thyroid profile and sex hormones, may be useful to diagnose metabolic risk factors leading patients to the CVS.

Imaging studies :

X-ray films of the neck may be needed to evaluate cervical vertebral curvature straightening in patients with neck pain. Orthopedic consultation or wrist MRI scans to evaluate the possibility of carpal tunnel syndrome may contribute to a complete diagnostic evaluation.

Other tests :

Luminance evaluation by electrical engineers (when feasible) conducted at the workplace is advisable.

TREATMENT AND MANAGEMENT

A primary care provider should lead and coordinate the multi-systemic evaluation of patients with computer vision syndrome (CVS). Awareness of both the ocular findings and the systemic findings is essential in the management of patients with the syndrome.

Indications used for eyeglass prescriptions in the general population are also used for patients with this syndrome. Antireflection Coating Glasses should be prescribed for patients with refractive errors, including presbyopia. Occupational glasses may be needed by some patients with this syndrome. Single vision lenses versus bifocals should be chosen according to the patient's needs and working distances.

Medical therapy:

- Topical lubricants
- Cyclosporine A ophthalmic emulsion
- Punctal occlusion

Surgical care :

Surgical indications used for patients with dry eye syndrome are also used for patients with CVS. Some patients may benefit from punctal plug insertion.

Consultations :

Since several ergonomic factors may contribute to CVS, engineer consultation is desirable at the workplace, including luminance evaluation of the working area.

Orthopedic and/or physical therapy evaluation is crucial in the diagnosis and treatment of cervical myositis and carpal tunnel syndrome in patients with this syndrome.

Medications :

Topical ocular tear replacement therapies are available with either vanishing preservatives or as preservative-free ophthalmic drops.

Refresh Tears (Allergan), a lubricant eye drop, is available with varying characteristics and viscosities. Refresh Tears is supplied in 15 cc and 30 cc bottles, for

repeated use, using the sodium chlorite Purite, a vanishing preservative system. A more viscous preparation, Refresh Liquigel is also available.

Systane (Alcon/Novartis) and Systane Preservative free (Alcon/Novartis) are lubricant eye drops that contain active demulcents such as polyethylene glycol 400 and propylene glycol buffering preservation system. Original Systane is preserved with Polyquad and formulated at a pH of 7.0.

Restasis (cyclosporine A ophthalmic emulsion) 0.05% (Allergan) is indicated to increase tear production in patients whose tear production is presumed to be suppressed due to ocular inflammation associated with chronic dry eye. Restasis has revolutionized the treatment of chronic dry eye disease. It provides a preservative-free emulsion that also replaces both the aqueous and the lipid component of the tear film. Restasis should not be used by patients with active infections of the eye or by patients with known or suspected allergies to any of the ingredients in the formulation.

Deterrence/ prevention :

Patients should avoid medications (e.g. antihistamines, anticholinergics) that may worsen dry eye.

Computer users who have dry eye should avoid wearing contact lenses, especially in the evening and at night when tear production is at its lowest.

Complications

Complications in patients with CVS are similar to those in patients with dry eye, including superficial punctate keratitis and keratitis.

Watch for optical decentration in eyeglasses by examining the patient's pupillary distance (PD). Consider using monocular PD measurements as needed. The patient's PD should be compared to the PD found in prescribed eyeglasses. Consider advising the optician on the patient's dominant eye.

Prognosis

Early evaluation, diagnosis, and intervention may prevent the symptoms associated with CVS. Symptoms associated with this syndrome may be improved with lubricants.

PATIENT EDUCATION[10]

Educate employers and school administrators to conduct luminance and humidity evaluations at the workplace.

Proper monitor positioning to decrease the angle of gaze at the monitor will also help in preventing the symptoms associated with the syndrome.

Figure 7 -Viewing the Computer

Some important factors in preventing or reducing the symptoms of CVS have to do with the computer and how it is used. This includes lighting conditions, chair comfort, location of reference materials, position of the monitor, and the use of rest breaks.

- **Location of computer screen** - Most people find it more comfortable to view a computer when the eyes are looking downward. Optimally, the computer screen should be 15 to 20 degrees below eye level (about 4 or 5 inches) as measured from the center of the screen and 20 to 28 inches from the eyes.
- **Air Conditioner-** Most of the offices related to computer use are air conditioned. Air conditioner causes rapid evaporation of tears resulting in dryness. Because of this, Air conditioner is one of the contributing factors in CVS. So minimum use of air conditioner is necessary to avoid CVS.
- **One Third Rule**- View a document you use every day on your computer monitor and then move back from the screen until it just starts to become blurred. Measure this distance and divide by three your monitor should be placed at that distance.

- **Reference materials** - These materials should be located above the keyboard and below the monitor. If this is not possible, a document holder can be used beside the monitor. The goal is to position the documents so you do not need to move your head to look from the document to the screen.

- **Lighting** - Position the computer screen to avoid glare, particularly from overhead lighting or windows. Use blinds or drapes on windows and replace the light bulbs in desk lamps with bulbs of lower wattage.

- **Anti-glare screens** - If there is no way to minimize glare from light sources, consider using a screen glare filter. These filters decrease the amount of light reflected from the screen.

- **Seating position** - Chairs should be comfortably padded and conform to the body. Chair height should be adjusted so your feet rest flat on the floor. If your chair has arms, they should be adjusted to provide arm support while you are typing. Your wrists shouldn't rest on the keyboard when typing.

- **Rest breaks** - To prevent eyestrain, try to rest your eyes when using the computer for long periods. Rest your eyes for 15 minutes after two hours of continuous computer use. Also, for every 20 minutes of computer viewing, look into the distance for 20 seconds to allow your eyes a chance to refocus.

- **Blinking** - To minimize your chances of developing dry eye when using a computer, make an effort to blink frequently. Blinking keeps the front surface of your eye moist.

Regular eye examinations and proper viewing habits can help to prevent or reduce the development of the symptoms associated with Computer Vision Syndrome.

COMPUTER AND ERGONOMICS

Ergonomics:

The term "ergonomics" is derived from two Greek words: "ergon," meaning work, and "nomoi," meaning natural laws. Ergonomists study human capabilities in relationship to work demands.

Ergonomics (or human factors) is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance.

Computer and Ergonomics:

Many people spend hours a day in front of a computer without thinking about the impact on their bodies. They physically stress their bodies daily without realizing it by extending their wrists; slouching, sitting without foot support and straining to look at poorly placed monitors.

These practices can lead to cumulative trauma disorders or repetitive stress injuries, which create a life-long impact on health. Symptoms may include pain, muscle fatigue, loss of sensation, tingling and reduced performance.

Ergonomics is a field of study that attempts to reduce strain, fatigue, and injuries by improving product design and workspace arrangement. The goal is a comfortable, relaxed posture.

Arrange Your Workstation: Every time you work, take time to adjust workstations that aren't quite right in order to minimize awkward and frequency performed movements.

Adapt Laptops: Laptop computers are not ergonomically designed for prolonged use. The monitor and keyboard are so close together that they cannot both be in good positions at the same time. For prolonged use, it's best to add a separate monitor and keyboard.

Modify Your Body Mechanics

Do you wear eyeglasses? Make sure they fit properly to avoid tilting your head. Type with light strokes, and try to keep your muscles relaxed.

Sit "tall," aligning your ears, shoulders and hips. When you sit, think about making yourself an inch taller. Switch hands when using a mouse, if you are able. Completely rest your wrists during breaks, including taking your hands off the mouse.

Adjust Your Work Patterns: Reduce prolonged computer time whenever possible. Break work into smaller segments and switch between tasks that use different motions. For example, alternate use of mouse with reading and searching the web.

Move: Movement has many benefits: it relaxes tissues, lubricates joints and prevents stiffness, improves circulation, reduces fatigue, and builds stamina. One study showed that heavy computer users who successfully avoided computer-related pain moved every 7 minutes.

At least every 10 minutes, take a short (10-20 second) break. Take your hands off the keyboard and move!

Every 30-60 minutes, take a brief (2-5 minute) break to stretch and/or walk around.

Exercise at Your Computer

Neck/Shoulders:

Neck Rotation: Slowly rotate your head as far as comfortable to the right, then left.

Shoulder Rotation: Circle your shoulders, then reverse directions.

Head Side to Side: Bend your neck so left ear approaches left shoulder, then repeat for right. Add a little resistance by pressing your hand against the side of your head.

Chin Tuck: Slide your chin inward, without bending your neck up or down. This is easiest to practice initially against a wall. Tuck chin in, attempting to touch back of neck to the wall while also maintaining head contact. Don't jam your chin down to your chest.

Shoulder Blade Retraction: Pull your shoulders down and back.

Shrug: Slowly raise your shoulders toward ears and hold for a few seconds. Gradually bring shoulders down and relax.

Back:

Shoulder Squeeze: Raise your arms in *front* of body, with elbows bent and thumbs up. Pull elbows back, squeezing shoulder blades together. Hold for a few seconds then release.

Stretch Up: Sit up straight and imagine a cable attached to the top of your head. Gradually stretch to be as tall as possible, hold for a few seconds, then relax.

Arms:

Arm Relaxation: Drop your arms and hands to your sides. Gently shake them for a few seconds.

Arm Rotation: Raise your arms in front of your body. Rotate arms so palms face up, then rotate so backs of hands face each other.

Hands/Wrists:

Wrist Flex: With your elbows on desk, gently use left hand to bend right hand back toward forearm. Hold for a few seconds, then relax. Repeat on other side.

Finger Fan: Spread your fingers as far apart as possible, hold, then clench fists, then release.

Feet:

Toe Curl: Flex toes up, then curl toes under. Release.

Foot Rotation: Circle foot slowly from the ankle, then reverse.

Eyes:

Eye Rolls: Roll your eyes clockwise then counterclockwise briefly.

Palm Eyes: Without touching your eyes, cup hands lightly over eyes for 30 seconds to rest them from light.

Look Away: Exercise your eyes by periodically looking away from your computer to focus on distant objects.

Keep fit**:** Physical fitness can help you avoid and treat problems related to computer use. Build your stamina with exercises for strength, flexibility, and cardiovascular health.

REVIEW OF LITERATURE ACCORDING TO ĀYURVEDA

'Cakṣuṣyeaṃdriya occupies the key position among all the other jñaneāmdriya which is responsible for' Rūpagrahaṇa.

Eye care is one of the priorities since the ages as it is a major source of direct knowledge and damage to eyes could immerse life into an ocean of darkness (Asṭaṃaga Saṃgrahā Uttarataṃtra 28/146).

Eye is one of the precious organs of human body. A separate branch Śālākyataṃtra has been provided in Āyurveda, as one among the Asṭaṃaga Āyurveda to care the precious parts above the clavicle (Ṣravaṇa, Nayana,Vadana,Ghrāna etc.) and eye (Nayana) is one among them. (Suṣruta Sūtrasthāna 1/10)

Nimī has dealt the disease of eye in detail and authored a compendium eye diseases on the basis of his clinical experience. Videha and Janaka have significant contributions to the early development of Śālākya.

Suṣruta Saṃhita written by Maharshi Suṣruta is the earliest available manual on surgery, provide glimpses of the strides of Nimī by describing the ancient ophthalmological considerations in detail. Suṣruta has mentioned various Netrarogas and their treatment in Uttarataṃtra.

Vāgbhatā I (Ashtang Sangraha), Vāgbhatā II (Ashtanga Hṛuadaya), Madhavkara(NidānaViniścaya), Śaraṃagdhara, BhāvPrakāśa, Bhāskar Goviaṃda Ghāṇekar (Bhaiṣajya Ratnāvalī), Yogratnākar etc have advanced this science with new therapies and compilations of ancient views.

NETRA SHARIR

Eyes are the two srotasas, out of nine bahirmukh srotasas.

Origin of Netra is from Aātmā and Paṃca Mahābhūta during the development of garbha. It is also one of the important constituent of karmapurūṣa, which is basic of therapeutics.

Measurement , Dimension and Shape:(Suṣruta Saṃhita Uttarataṃtra 1/9-10)

Suṣruta has mentioned measurement and dimensions of the eye as Amtapraveśa- 2 aṃgula, Āyāma-$2^{1/2}$ aṃgula, Vistāra-$2^{1/2}$angul. Shape is Vṛuttākārā and Gostānākār.

Panchabhoutikatva: (Suṣruta Saṃhita Uttarataṃtra 1/11)

Māṃsal or solid part is made up of Pṛuthvī Mahābhūta, Raktavarṇa part is made up of Agni Mahābhūta, Śuklavarṇa part is made up of Jala Mahābhūta. Kṛuṣnavarṇa part is made up of Vāyū Mahābhūta and Āṣrūmārgas are made up of Ākāśa Mahābhūta.

Suṣruta described the Netra Śārir according to Nidāna and Cikistā into three distinct parts called Maṃḍala, Patala and Saṃdhī
(Suṣruta Saṃhita Uttarataṃtra 1/14)

Maṃḍala:

These are 5 in number from outer most to inner most layers and are as follows;

1) Pakṣma Maṃḍala 2) Vartma Maṃḍala 3) Shweta Maṃḍala

4) Kṛuṣṇa Maṃḍala 5) Dṛuṣṭī Maṃḍala

Patal:

Netra consists of 6 patals out which two are Vartma patals and remaining four are situated in eyeball.

1) First- Tejojalāṣrit 2) Second- Maṃsasrita

3) Third- Medoṣrita 4) Fourth- Asthyaṣrita

Saṃdhī:

These are 6 in numbers named as-

1) Pakṣmavartmagata 2) Vartmaśuklagata 3) Śuklakṛuṣhṇagata

4) Krushnadristigata 5) Kaninīkā 6) Apāṃga

Dṛuṣṭī:

Drushti is described to be of the size of masūrdāla made up of paṃca Mahābhūta.Its brightness is similar to spark of fire occupied by perishable teja enclosed by patals. It is vivarākṛutī and śitasātmya.

(Suṣruta Saṃhita Uttarataṃtra 7/3,4)

Akṣi baṃdhana:

Proper alinment of the parts the eye depends upon sirā, kaṃḍara, meda, kalaka, kṣleṣma etc.

Marma:

Apaṃga Marma is situated at the lower end of each eyebrow and on outer side of the eye. Āvarta Marma are two in number and situated above the eyebrow. Any trauma to these two marmas causes blindness and diminished vision. The place, where dhaman+ī nourshing tongue, ear, nose and eye unite is called Sṛungāṭak marma. These are 4 in number and are sadyapraṇaharaḥ.

Sirā and Dhamanī:

There are 34 Sirās, which transports Vāta(8), pitta(10), Kapha(8) and rakta(8) to the eyes

Peśī and Snāyū:

There are 2 peśīs and 30 snāyūs in the eye.

Asthī and Saṃdhī:

Akṣi koṣā or eyelids contain a Tarūnāshtī.

Strotasas:

The eyes are considered among the bahirmukha srotasas. (External orifice).

Concept of Aṣrumarga (Lacrimal Appraratus) in Āyurveda:

Aṣrumarga are formed by the Ākāśa mahābuthās and consists of Aṣru strotasas. i.e. the lacrimal passage, which conduct the tears from the conjuctiva into the nasal cavity.

Videha the founder of Indian ophthalmology has stated that two Aṣruvaha Sirās (channels) open into medial angles at canthus formed by the both upper and lower lid, i.e. kaninīkā saṃdhī respectively.

NETRA KRIYĀŚĀRĪR

External subject`s knowledge is given to soul in body by the five senses – Netra, Karna, Nāsā, Jivhā, Tvacā. Inspite of all these five senses being pāṃcabhautīk, the iaṃdriya sense which is formed by that Mahābhūūt, it takes guṇa / taṃmatrā of that respective Mahābhūt. Netra Utpattī is primarily from Tej Mahābhūt. So netra accepts only Tej Mahābhūtatmaka Rūpa. Senses are present in very minute / sūkṣma form in śiro bhāga and Eye, Nose, Ear, etc. are their Sthūla Adhiṣṭhana. Form Sense in Eye is done by Dṛuṣṭī which is place of Ālocaka Pitta. This sense via Dhamnīs doing Rūpagrahaṇa with prāṇa vāyū reaches Mana and Ātmā and then only knowledge of particular thing occurs.

Paṃcapaṃcak of Netra:-

- Jňaneṃdriya – Cakṣūṣreṃdriya
- Related Mahābhūta – Teja Mahābhūta
- Jňaneṃdriya Adhiṣṭhana – Netra
- Jňaneṃdriya Artha – Roop Tanmatra
- Jňaneṃdriya Buddhi - Cakṣūṣreṃdriya Buddhi + Mana + Ātmā

So when Ātmā combines with Mana, Mana with Iaṃdriya Buddhi, Iaṃdriya Buddhi with Tanmatra, Tanmatra with Adhiṣṭhana, Adhiṣṭhana with respective Mahābhūta and Mahābhūta with respective sense, then Iaṃdriya Jňāna occurs. In the function of form sense Prāṇāvāyū and Tarpak kapha which is situated in shirobhāg plays a vital role.

Netra- Doṣa:

1) Vāta Doṣa Prāṇāvāyū -

Netra Iaṃdriya is one of the site of Prāṇāvāyū which helps in the visual process.

2) Pitta Doṣa (Alocaka) –

Alochaka pitta is the principle pitta which is responsible for visualising the object and is situated at the Netra Iaṃdriya .

3) Kapha Doṣa (Tarpak) –

The types of kapha which presents in the cranial cavity and which gives lubrication to eyes is called as Tarpak Kapha.

Dhātū:

All seven dhātū constitutes the eyeball.

Total 76 eye diseases have been described pertaining to the different part of eye. According to site they are classified as pakṣmagata, saṃdhīgata, vartmagata, śuklagata, kṛuṣṇagata, sarvagata, druśṭīgata, and āgaṃtuja.

REVIEW OF DISEASE ŚUṢKĀKṢIPĀKA

Signs and symptoms of disease according to Āyurveda

(Suṣruta saṃhita Uttartaṃtra 6/26), (Aṣṭaṃga Saṃgraha Uttartaṃtra 18/16)

1. Rūkṣhtā,
2. Samkoca in netra and vartma,
3. Aviladarśana,
4. Darūnpratībodhana,
5. Gharṣaṇa,
6. Toda, bheda, shūla,
7. Upadeha,vikūṇa, viśūṣkatvam,
8. Śīteccha etc.

Due to vitiation of Vāta and pitta doṣa in body or locally, they reach to eye in its different parts via Sirās and produce disease. This shows above signs and symptoms.

Śuṣkākṣipāka is one of the Sarvagata Sādhya Vyādhī.

Nidāna(Hetū):

The hetū of Śuṣkākṣipāka is not explicit in the classics. However, Scholar of Āyurveda has explicit in the classics the common etological factors for all the netrarogas. **(Suṣruta Saṃhita Uttarataṃtra 1-26, 27)**

1. Ahāra:

- Vidahīannapāna- means that which produces fermentation.
- Asātmyahāra- Foods that inhabituated to body.
- Virūddhaahāra- Foods that have opposite guṇas,which are excessive śīta – kṣāra – āmla – tīkṣṇa gurū guṇa , excess in water will create agnīmāṃdya and indigestion and that causes vidhata.
- Excessive intake of alcoholic preparation like śukta, aranala and dhanyāmla.
- Excessive intake of āmala dravyas, kulatthaṃ(horsegram), maṣa(black gram)

2. **Vihāra:**
    - Sudden plunging into cold water after exposing oneself to sun
    - Looking at distant object for a prolonged period.
    - Constant looking at minute object
    - Improper sleeping habits like sleeping during daytime, awakening in the night, dropping of the head during sleep, or resting the head on big pillows
    - Suppresion of physiological urges like vomiting, micturition, weeping and flatus.
    - Atiyoga of sveda
    - Excessive physical exertion
    - Exposure to smoke, dust
    - Excessive smoking
    - Unpleasant environmental situations
    - Injuries to head and eyes

3. **Manasika:**
    - Excessive Weeping, grief, Worry, fatigue
    - Excessive stress and strain, emotions etc.

Pūrvarūpa:

- Symptoms of pitta vitiation such as burning sensation, redness, pain.
- Symptoms of Vāta vitiation such as pain, difficulty in lid movement are the common premonitory symptoms of netrarogas.
- Symptoms of kapha vitiation such as itching, heaviness, hardness, etc.
- The signs and symptoms are not manifested completely or distinctly. Sometime patient may fell like the presence of sand, dust or paddy grains in eyes. The slight diminution or impairment of vision is the common prodromal symptoms of eye diseases.

Rūpa:

When sthanasaṃṣraya of prakūpita dośa takes place, then only cardinal signs and symptoms of the existing disease occurs. Śuṣkākṣipāka presents with the following signs and symptoms-

- Dirty eye with discharge
- Dryness of eyes
- Lid-Dry and Rough touch.
- Burning Sensation,
- Pricking sensation,
- Difficulty in opening and closing the lids.

Table 1-Correlations of sign and symptoms

According to Āyurveda	According to modern
Śuṣktva	Dryness
Dāha	Burning sensation
Avīl darśanaṃ	Decreased visual acuity and excessive debris and mucus strands.
Gharṣaṇa	Foreign body sensation
Toda, Bheda	Tearing, Pricking pain
Śīteccha	Liking for colds

SAṂPRAPTĪ

Due to Nidāna sevana, the vitiated doṣas in the body (predominant vāta and pitta) move towards the head through the Sirā and get localized in all parts of Akṣī causing Śuṣkākṣipāka.

Figure 8 – Flow Chart of Samprapti

Hetū sevana, atiyoga and mithyayoga of Cakṣuiaṃdriya

↓

It Aggrivates Vāta pradhan pitta doṣa.

↓

It vitiates raktadhatū in the Sirā

↓

(increased rūkṣata and daha, etc.)

↓

These vitiated doṣas moves towards the eye through Sirā.

↓

Kha-vaigūṇya present in the Sarvakṣī

↓

Produces symptoms like rūkṣata, dāha,

↓

kaṃdū, āraktā, avila netrata, etc

↓

Śuṣkākṣipāka

Sādhyāsādhyatva:

Śuṣkākṣipāka is sādhya vyādhī.

Cikitsā:

In Āyurvedic classical text of Śālākya Taṃtra can see two types of treatment i.e. Bāhya and Abhyaṃtara cikitsā.

A) Local Treatment:

- Tarpaṇa- Jīvanīya Ghṛita ,
- Aṃjana- Snehaṃjana etc.

B) Systemic:

- Śodhana and Śamana
- Snehana- Paṃcatikta or Jīvanīya Ghṛita ,
- Svedana- steam bath
- Raktamokṣana- Jalaukā, Sirāvedha ,
- Bastīkarma
- Nasya- Anutaila
- Ghṛitpāna- Jīvanīya Ghṛita

KRIYĀKALPA

A variety of routes employed for the administration of the drugs into the body system. In the field of ophthalmology Ācaryas has given equal importance to systemic and local administration of the drugs. The modes of applications of medicines in eye are specifically modified procedures to suit the anatomical and physiological peculiarities of eye. Treatments of eye diseases consists of specific and important drug administrative procedures called "Kriyākalpa". They are basis of the ophthalmic disorders, as Paṃcakarma is the basis of KayaCikitsā.

Etymology:

Kriyā means to do, to perform or to practice. The word Kriyā denotes therapeutics, which cures the disease without causing any adverse effects.

Kalpa means practicable, feasible, proper or competent method of curing the disease. So, Kalpa indicates the specific formulations adopted to the therapeutics procedures.

Hence, the word 'Kriyākalpa' literally means to perform proper treatment.

Definition:

No specific definition of Kriyākalpa has given given by the ancient Ācaryas except the commentor Dalhana who opines that Kriyākalpa includes various preparations like Aścotana, Tarpaṇa, Putapāka etc for the treatment of eye diseases, as a local measure.

Classification:

According to Ācarya Śuṣruta there are five types of Kriyākalpa viz

1. Tarpaṇa 2. Putapāka 3. Pariṣeka 4. Aścotana 5. Aṃjana

Ācarya Vāgbhata has described six therapeutics procedures in the treatment of eye diseases. They are:

1. Aścotana 2.Pariṣeka 3. Viḍālaka 4. Aṃjana 5. Tarpaṇa 6. Putpāka

Ācarya Śāraṃgadhara and Bhavmiṣra have described the treatment of diseases under heading of 'Kalpa'. He has described seven types of Kalpa as;

1. Tarpaṇa 2. Putpāka 3. Aścotana 4. Pariṣeka 5.Aṃjana 6.Pindī 7. Viḍālaka

AŚCOTANA KARMA

Aścotana is one of the most important procedure among all the Kriyākalpas. Ācarya Vāgbhata quoted that it is Ādya Upakarma in all the eye diseases.It can be done at any time in emergency conditions, as a treatment procedure in the complication of other Kriyākalpas and in the acute as well as severe conditions including Nayana abhighata**.**

(Vāgbhata Sutrasthana 23/1)(Suṣruta Saṃhita Uttarataṃtra 18-44)

Nirūkti:

Netra Secana or Cakṣu Pūrṇa. It means trickled, dripped and sprinkling application to the lids. So, in Aścotana, medicine is instilled drop by drop in Kaninīkā Saīdhi (inner canthus area) from two finger height.

Advantages:

1. All Ācaryas have explained the importance of the Aścotana Karma.
2. Ācarya Vāgbhata has quoted Aścotana as the foremost procedure for treatment of all ocular ailments.
3. It is safe well as most economic procedure.
4. It eliminates Doṣas from Urdhva Jatrū effectively.
5. Aścotana is useful in acute symptoms also.

Table 2 -Aścotana, dose and time to perform according to various Ācaryas.

Types	Pradhāna Doṣas	Time to perform		Dose
			Ācarya Suṣruta and Śāraṃgdhara Saṃhita	Bhāvaprakāśa
Lekhana	Kapha	Pūrvhana (Morning)	7-8 drops	8 drops
Ropaṇa	Pitta-Rakta	Madhyānha (noon)	12 drops	10 drops
Snehana	Vāta	Aparanha (evening)	10 drops	12 drops

Table 3 -Guṇa and Rasa of the drugs of Aścotana according to predominance of the doṣas.

Dosha	Guṇa	Rasa
Vāta	Sukhoṣṇa, Snigdha	Tikta
Pitta-Rakta	Mrudu, Śīta	Madhura
Kapha	Uṣna, Tīkṣṇa, Rūkṣa, Mrudū, Viśada	Tikta, Kashaya
Sannipātaja	Kouṣna, Tīkṣṇa, Uṣṇa, Mrudū, Śīta	Miṣra bheṣaja-acc. To Doṣa predominance

Indications:

- Rujā- pain
- Toda- Pricking pain
- Kaṃdu- itching
- Gharṣṇa- Foreign body sensation
- Dāha- Burning sensation
- Aṣrustrava- Excessive lacrimation

Procedure (Vāgbhata Sūtrasthān 23/2, 3, 4)

It can be divided into three parts;

1. Pūrva Karma: Patient should be in lying position relaxed in Nivaṃta Sthana (a place devoid of breeze). Aścotana Dravya should be filtered through thick cotton pad or a clean cloth.

2. Pradhāna Karma: Physician should open the eyes of the patients with left hands and medicine is dispensed drop by drop either with a seashell or a wick (held in right eye)from two finger height just above Kaninīka Saṃdhī (inner canthus area).

3. Paścāta karma: The eyes should be cleaned with soft cloth. In case of Kapha and Vāta predominant condition mridu Svedana (mild fomentation) should be done with a piece of cloth rinsed in warm water.

Retention period: The medicine should be retained in the eyes for 100 Matra Kala. According to Āyurveda pharmacopeia of India-Vol2.

100 Matra = 155.28 seconds = 2.58 minutes.

Samyak yoga lakṣana:

- Netra Vaimalya- clearness of the eye.
- Vedanā Upaśaman-relief of pain.
- Vyādhī Nivruttī-cure of the disease.
- Netra Laghava- feeling of lightness in eye.

Atiyoga lakṣana:

- Raga- congestion.
- Doṣa Paristrava- Profuse discharge

Mithyayoga lakṣana

- Avila Netratā- dirty/muddiness of the eye.
- Gaurava- feelings of heaviness in eyes.
- Roga Vṛiddhī- more acuteness of disease.

Duration:

Aścotana can be performed for one days/ two days/ three days/up to patient get cured /tolerate.

Time to perform:

Aścotana can be performed at any time of day and first three hours of night time .However if there is severe pain and emergency conditions, it can be done at any time.

Contraindications:

Aścotana should be not performed in night time except first three hours.
Proper care should be taken for preparation and instillation of Aścotana drava in patient's eye. If it is Atiuṣna, Atiśīta, Bahū Matrā ,Alpa Matrā and Aparistruta, it leads to the some complications.They are as below:

- Ati Uṣṇa: Rujā, Raga, Druṣtīnasha
- Ati ṣīta: Nistoda ,Staṃbha, Vedana
- Bahū Matrā: Kaṣāya Vartma , Gharṣaṇa
- Apristruta: Saraṃbha Utpattī

In Āyurveda, Aścotana (eye drops) has been described in detail. In Aścotana procedure, Ācarya has described use of snigdha and madhur rasātmakadravya in Vātapittajanya Vyādhī.

Goghṛuta is Vatpittaghna, Cakṣuṣya and having properties of snigdhaguṇa. It is easily available.Goghṛuta is semisolid at room temperature. So for liquification and partical free solution, we can put it in warm water before use.

Aścotana vidhī is contraindicated at night time, but if we use Goghṛuta in a daytime Goghṛuta can form a thin layer over eye which can cause blurred vision throughout day. So that Goghṛuta eye drops (Aścotana) can be done in evening time after day work.

DRUG REVIEW

- **Goghruta**
- **Moisol Eye Drop**
- **Antireflection Coating Glasses**

DRUG REVIEW

GOGHṚUTA

The Godūgdha is considered to possess the essence or sap of all plants and Goghṛuta is the essence of Godūgdha. When we consider Goghṛuta we are in the company of superlatives. In India, Goghṛuta has been so highly regarded for so many things**. (Suṣruta sūtrasthana 45/14),**

Classification

Caraka saṃhita – Ghṛutavarga,

Suṣruta Samhita – Ghṛutavarga,

Bhāvprakāśa – Ghrutavarga

Synonyms-

Sanskrita - Ajayā, Havish, Sarpīśa, Ghṛutaṃ **Hindi -** Ghee, Ghṛuta

Tamil - Nayi **Telgu -** Neyi

Marathi - Tūp

As per (Āyurvedic Pharmacopia, Part-1Vol-VI) Āyurveda properties of Goghṛuta are as follows -

Rasa : Madhura

Gūṇa : Gurū, Snigdha, Mridū

Veerya : Śīta

Vipaka : Madhura

Karma : Agnīdīpana, Anubhiṣyaṃdi, Ayuṣya, Balya**, Cakṣuaṣya**, Dīpana, Hṛudya, Kaantīprada, Medhya, Ojovardhaka, Rasāyana, Ruchya, Kṣleṣmavardhana, Snehana, Śukravardhaka, Tejobalakāra, Tvacya, VātapittapraŚamana, Vayaasthapna, Viṣahara, Vṛuṣya.

Ghruta, Taila, Vasa & Majja are useful for snehan .But Ghruta is best between all of them.

According to Ācarya Caraka ,Goghṛuta is vātaghana and pittaghana .It is Rasa, Śukra and Ojhavṛuddhikara .Goghṛuta is Mṛudukara, Svaravarṇaprasādana and Balvardanaṃ.

QUALITIES OF GOGHṚUTA

- Goghṛuta is known as a substance that gives longevity… This is because it has opposite qualities (heavy, slow, oily, liquid, dense, soft), and thus pacifying effects, to the light, dry and rough qualities of Vāta doṣa. Goghṛuta, in a very sure and steady way, slows the aging process by balancing the living one. **(Yogratnakar 2) (Nighaṇtu Ratnakar)**
- Goghṛuta has the quality of snigda, oiliness, and unctuousness. It is smooth, lubricated and nurturing. Goghṛuta is thought to make the voice soft and melodious.
- Goghṛuta is Guru, heavy. It increases the qualities of Kapha and decreases Pitta and Vāta, which are both light.
- Goghṛuta has the quality of mṛudu, softness. In Āyurvedic Paṃcakarma treatments, Goghṛuta is the oil used on the eyes. In Netra Bastī, a small dam is built around the eyes and filled with warm Ghee. Then, you open your eyes to its soothing softness. It seems after that treatment, that you see the world though a soft diaphanous curtain of love and loveliness.
- Goghṛuta is obtained from the class of mammalian of animal kingdom (jaṃgam) especially from cow, buffalo, goat, sheep and camel. Out of this two are the main sources of milk and milk products in the areas of their habitat. Though the ghruta of these animals posses many common features, Āyurveda discriminates their particular features also and recommends Goghṛuta as best and the ghruta of choice for both food and medicinal purposes. So in Āyurvedic classics and tradition, if not specified epithet ghṛuta always applies to Goghṛuta.

PHYSICOCHEMICAL CHARACTERISTICS OF GOGHṚUTA

Chemically, Goghṛuta is a complex lipid of glycerides (usually mixed), free fatty acids, phospholipids, sterols, sterol esters, fat soluble vitamins, carbonyls, hydrocarbons, carotenoids, small amounts of charred casein and traces of calcium, phosphorus, iron, etc. It contains not more than0 .3% moisture. Glycerides constitute about 98% of the total material. Of the remaining constituents of about *2%,* sterols (mostly cholesterol) occur to the extent of about 0.5%. As Goghṛuta contains 98% glycerides, it has lubricating properties which is mainstay of computer vision treatment. It contains vitamin A 3500/100gm.It also Contains beta-carotene and Vit E.

Table 4- Ingredients of Goghṛuta

Moisture	14.4%
Fat	32.4%
Protein	36%
Lactose	12%
Ash	5.2%

According to Russian scientist Servos, Goghṛuta has immense power to protect human body from all ill effect of radioactive waves, evaporation.

CHEMICAL COMPOSITION OF GOGHṚUTA

Table 5- Chemical Composition

Content	%	Content	%
Triglycerides	97.98	Lipids	0.2 – 1
Diglycerides	0.25 -1.5	Sterols	0.22 – 0.4
Monoglycerides	0.16 - 0.038	Vit.A	2500 / 100 gm
Ketoacid glycerides	0.015 – 0.018	Vit.D	8.5x10.7 gm / 100gm
Glycerylesters	0.011 – 0.015	Vit.E	24 x 10.3 gm / 100gm
Free fatty acid	0.1 – 0.44	Vit.K	1.0 x 10.4 gm/ 100gm

Goghṛuta also contains Vit. A, D, E and K. Vitamins A and E are antioxidants and are helpful in preventing oxidative injury to the body. Vitamin A keeps epithelial tissue of the body intact, keeps the outer lining of the eyeball moist and prevents blindness.

Digestion, absorption and delivery to a target organ system are crucial in obtaining the maximum benefit from any formulation, this is facilitated by Ghruta. Since active ingredients are mixed with Ghruta, they are easily digested and absorbed. Lipophilic action of Ghrita facilitates transportation to a target organ and final delivery inside the cell. The modern lipophilic nature can be compared with the Yogvahi Guna which facilitates entry of the formulation into the cell.

This property creates good medium for absorption, transport and delivery of Āyurvedic formulations.

FUNCTIONS

- The lipids serve the following important function.
- Structural components of bio membranes (phospholipids)
- Metabolic regulators (steroid hormone and prostaglandins)
- Storage forms of energy (Triglycerides)
- Acting as electric insulator in neurons.
- Adding taste palatability to food.

MOISOL EYE DROP

Hydroxy Propyl Methyl Cellulose

It is also known as Hypermellose, which is non-proprietary name for this substance**.**

Hydroxy Propyl Methyl Cellulose (HPMC) an inert, semisynthetic drug. It is viscoelastic polymer used as an ophthalmic lubricant.

It is also useful as an excipient and controlled delivery component in oral medicaments.

Chemistry-

HPMC is an aqueous solution. It exhibits a thermal gelatin property. When the solution heats up to a critical temperature, the solution congeals into a non flowable but semi flexible mass.

Uses-

There are many fields of application for Hydroxy Propyl Methyl Cellulose.

- **Eye drops**
- Pharmaceutical
- Paints & Coatings
- Cosmetics
- Tissue adhesives
- Gypsum products

Ophthalmic Use-

HPMC was patented as a semisynthetic substitute for tear film. It is highly water soluble. Its good water solublity reportedly aids in visual clarity.

When used in eyes, HPMC acts to swell and absorb water & thereby expanding the thickness of the tear film. HPMC augmentation therefore results in extended lubricat time presence on the cornea, which results in decrease in symptoms of CVS.

MOISOL (Hydroxy propyl methyl cellulose) eye drop

Qualitative and Quantitative composition

- Hydroxy propyl methylcellulose 0.7% w/v
- Borax 0.19%w/v
- Boric acid 0.19%w/v
- Sodium chloride 0.45%w/v
- Pottasium chloride 0.37%w/v
- Benzalkonium chloride 0.01%w/v
  (As Preservative)
- Sterile isotonic aqueous vehicle…..q.s.

Pharmaceutical form-

Eye drops, solution - Clear to slightly opalescent colourless, slightly viscous solution

Therapeutic Indications-

- It is used as artificial tears to prevent damage to the cornea in patients with keratoconjuctivitis sicca.
- It is also used to moisten hard contact lenses and to lubricate artificial eyes.
- It provides immediate relief of dry eye conditions (including dry eye conditions associate with computer use.)

Special warnings and precautions for use-

- May cause transient mild stinging or temporary blurred vision.
- In Order to preserve sterility, the dropper should not be allowed to touch any part of the eye or any other surface. (Label warning: Do not touch any part of the eye with the dropper.)
- The product contains benzalkonium chloride and should not be used if soft contact lenses are being worn.
- Remove contact lenses prior to application and wait at least 15 minutes before reinserting.
- Benzalkonium chloride is known to discolour soft contact lenses.

Shelf life –

Unopened : 24 months

After first opening : 1 month

Special precautions for storage –

Protect from light.

Do not store above 25^0 C.

ANTIREFLECTION COATING GLASSES[11]

Anti-reflective coating (also called AR coating or anti-glare coating) improves both your vision through your lenses and the appearance of your eyeglasses. Both benefits are due to AR coating's ability to eliminate reflections of light from the front and back surface of eyeglass lenses.

Today's modern anti-reflective coatings can virtually eliminate the reflection of light from eyeglass lenses, allowing 99.5 percent of available light to pass through the lenses and enter the eye for good vision.

The visual benefits of lenses with anti-reflective coating include sharper vision with less glare when driving at night and greater comfort during prolonged computer use (compared with wearing eyeglass lenses without AR coating).

AR coating is especially beneficial when used on high index lenses, which reflect more light than regular plastic lenses. Generally, the higher the index of refraction of the lens material, the more light that will be reflected from the surface of the lenses. For example, regular plastic lenses reflect roughly 8 percent of light hitting the lenses, so only 92 percent of available light enters the eye for vision. High index plastic lenses can reflect up to 50 percent more light than regular plastic lenses (approximately 12 percent of available light), so even less light is available to the eye for vision. This can be particularly troublesome in low-light conditions, such as when driving at night.

Today's modern anti-reflective coatings can virtually eliminate the reflection of light from eyeglass lenses, allowing 99.5 percent of available light to pass through the lenses and enter the eye for good vision.

Figure 9- Reduction in glare by ARC glasses

Anti-reflective coating reduces the glare that you see, as well as the glare that others can see on your lenses.

By eliminating reflections, AR coating also makes your eyeglass lenses look nearly invisible so people can see your eyes and facial expressions more clearly. Anti-reflective glasses also are more attractive, so you can look your best in all lighting conditions.

The visual benefits of lenses with anti-reflective coating include sharper vision with less glare when driving at night and **greater comfort during prolonged computer use (compared with wearing eyeglass lenses without AR coating).**

Anti-reflective coating also is a good idea for sunglasses, because it eliminates glare from sunlight reflecting into your eyes from the back surface of tinted lenses when the sun is behind you. (Generally, AR coating is applied only to the back surface of sunglass lenses because there are no cosmetic or visual benefits to eliminating reflections from the front surface of dark-tinted lenses.)

Most premium anti-reflective coatings include a "hydrophobic" surface layer that prevents water spots from forming and makes the lenses easier to clean. Some AR coatings also include an "Oleophobic" surface layer that repels skin oils and makes it easier to remove smudges from the lenses.

Some eyeglass lenses have factory-applied AR coating on both lens surfaces. Other lenses, particularly progressive lenses and other multifocal lenses (i.e. bifocals and trifocals), have the coating applied after the lenses have been customized to your eyeglass prescription by an optical lab.

How Anti-Reflective Coating Is Applied

Applying anti-reflective coating to eyeglass lenses is a highly technical process involving vacuum deposition technology.

The first step in the AR coating process is to meticulously clean the lenses and inspect them for visible and microscopic surface defects. Even a tiny smudge, piece of lint or hairline scratch on a lens during the coating process can cause a defective AR coating

Typically, a production line includes multiple washing and rinsing baths, including ultrasonic cleaning to remove any traces of surface contaminants. This is followed by air drying and heating of the lenses in special ovens to further remove unwanted moisture and gases from the lens surface.

The lenses are then loaded into special metal racks with spring-loaded openings so the lenses are held securely but with virtually all lens surfaces exposed for the coating application. The racks are then loaded into the coating chamber. The door of the chamber is sealed, and the air is pumped out of the chamber to create a vacuum.

While the lens racks are rotating in the coating chamber, a power source within the machine focuses a beam of electrons onto a small crucible that contains a series of metal oxides in separate compartments. When bombarded by the beam of this electron "gun" in succession, the metal oxides are transformed into vapors that fill the coating chamber and adhere to the lenses in a specific order to form a precise multilayer AR coating.

Each AR coating manufacturer has its own proprietary formula, but generally all anti-reflective coatings consist of multiple microscopic layers of metallic oxides of alternating high and low index of refraction.

Depending on the AR coating formula, most lenses with anti-reflective coating have a very faint residual color, usually green or blue, that is characteristic of that particular brand of coating.

Anti-reflective coatings are incredibly thin. The entire multilayer AR coating stack generally is only about 0.2 to 0.3 microns thick, or about 0.02 percent (two one-hundredths of 1 percent) of the thickness of a standard eyeglass lens.

Caring for Glasses with Anti-Reflective Lenses:

When cleaning AR-coated lenses, use only products that your optician recommends. Lens cleaners with harsh chemicals may damage the anti-reflective coating. Also, don't attempt to clean AR-coated lenses without wetting them first. Using a dry cloth on a dry lens can cause lens scratches. And because anti-reflective coating eliminates light reflections that can mask lens surface defects, fine scratches often are more visible on AR-coated lenses than on uncoated lenses.

PREVIOUS WORK DONE

PREVIOUS WORK DONE

Previous Work done related to this topic was studied from research papers, articles, M.D & PhD work and internet also.

- A Clinical Study On "Computer Vision Syndrome" and its management with Triphala eye drop and Saptamṛuta Loha by Dr. M P Gangamma, Dr. Poonam & Dr. Manjusha Rajgopal in 2010. (Ayu.2010:31(2):236-239)

In this clinical study on CVS, 151 patients were registered, out of whom 141 completed the treatment. In Group A, 45 patients had been prescribed Triphala eye drop, in Group B 53 patients had been given Triphala eye drops and Saptamṛuta Loha tablets internally, in Group C 43 patients had been prescribed Placebo eye drops & Placebo tablets. In total, marked improvement was observed in 48.89, 54.71 & 06.98% patients in groups A, B and C respectively.

- Clinical efficacy of Āyurvedic management in Computer vision Syndrome. A Pilot study by Dr. Kartar Singh Dhiman, Dr. Deepak Kumar Ahuja and Dr. Sanjeev Kumar Sharma.(Ayu.2012Jul-sept;33(3):391-395)

In this clinical study, 30 patients were randomly divided into 3 groups. In Group I, Shatavaryadi churna (orally) & Goghṛuta netra tarpan was given. Significant improvement in all parameters were observed. In Group II and III, Goghṛuta tarpan and counseling about computer ergonomics was given respectively. No significant results were observed in both groups.

- Effect of yoga on self-rated visual discomfort in computer users by Shirley Telles, KV Naveen, Manoj Dash, Rajendra Deginal and NK Manjunath in 2006.(Head & Face Medicine 2006,2:46)
  Available from - http:// www.head-face-med.com/content/2/1/46

Two hundred and ninety one professional computer users were randomly assigned to two groups, Yoga (YG, n=146) and wait list control (WL, n=145). Both groups were assessed at baseline and after 60 days for self rated visual discomfort using standard questionnaire. During these 60 days the YG group practiced an hour of yoga daily for five days in a week and the WL group did their usual recreational activities also for an hour daily for the same duration. The results suggest that the yoga practice appeared to reduce visual discomfort, while the group who had no yoga intervention (WL) showed an increase in discomfort at the end of 60 days.

- The Efficacy of Triphala Yog in Dry eye syndrome due to Excessive use Of Computer by Dr. D.B. Kadam in 2007 at Bharati Vidyapeeth University Pune.

In this study 60 patients of dry eyes due to excessive use of computers were randomly divided into 2 groups. 30 patients of trial group were received Triphala yog at night and 30 patients of control group were received Cap. B complex at night. Follow up was done on 7^{th}, 14^{th} & 21^{th} day. Results suggest that Triphala Yog appeared effective in various symptoms of dry eye syndrome except TFBUT & Schirmer's Test 1.

MATERIALS AND METHODS

- **Materials**
- **Methodology**

MATERIALS AND METHODS

MATERIALS

- **Goghṛuta Eye Drops- Drug for Trial Group**
- **Moisol Eye Drop – Drug For Control Group 1**
- **Antireflection Coating Glasses For Control Group 2**

GOGHṚUTA

Goghṛuta was prepared from Indian cow milk as per standard method.

METHOD OF PREPARATION OF GOGHṚUTA

- For preparation of Goghṛuta, milk was obtained from Indian cow.
- Curd was prepared from milk.
- Curd was churned in an earthenware pot with wooden churn, and makkhan (desi butter) was collected till a sufficient amount has been accumulated.
- Then it was reheated to evaporate the moisture.
- The scum was removed with the help of perforated ladle.
- After preparation Goghṛuta was filled in autoclaved 10 ml bottles.

AUTHENTIFICATION & STANDARDISATION OF GOGHṚUTA

After preparation of Goghṛuta,

- **Authentification was done at Pune University**.
- **Standardisation was done at Late Principal B.V. Bhide lab, Pune.**

Some Physiochemical tests like Total Fat content (82.91%), Total Ash Content (0.69%), Saponification Value (231.70), Iodine Value (52.05), Acid Value (0.38), Refractive index (1.446). It was also checked for the adulteration of Vanaspati Ghee (Negative).

- Goghṛuta was filled in airpacked autoclaved 10 ml bottles.
- Special case paper was prepared with written consent of a patient.
- Total plan of the treatment was explained to patients in their own language.
- After obtaining Institutional Ethic committee Ethical permission, a randomized control clinical study was carried out.

Figure 10 – Photo of Goghṛuta

Figure 11 – AUTHENTIFICATION CERTIFICATE

पुणे विद्यापीठ
University of Pune

वनस्पतिशास्त्र विभाग
Department of Botany
पुणे विद्यापीठ
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गणेशखिंड, पुणे – ४११ ००७ (भारत)
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सं.क्र. : वनस्पतिशास्त्र/
Ref.No. : Bot/

दिनांक :
Date :

AUTHENTIC CERTIFICATE

This is to certify that **Dr. Santosh Shivaji Mulik** of Bharti Vidyapeeth Deemed University college of Ayurveda, Pune-411043. He has selected research topic of his Ph. D. Shalakyatantra degree which is as given below-

"THE EFFICACY OF GOGHRUTA ASCHYOTAN IN COMPUTER VISION SYNDROME"

Under this study the specimen which he has been submitted to me for the standardization & authentication were identified & confirmed as:

Item No.	**Standardization and Authentication**
Indian Cow Goghrut	As it is

The sample which was submitted in as it is and identified as above. This is for information & necessary action.

The authentication of the sample was done by confirmation of Physico-chemical tests.

Department of Botany PUNE 411 007 University of Pune

Dr. S. S. Deokule
Professor
Department of Botany,
University of Pune
Pune-411007.

Figure 12 – STANDARDISATION CERTIFICATE

A. S. Bhave
Hon. Director

Shikshana Prasaraka Mandali's
Late Prin. B. V. Bhide Foundation
For Education & Research In Chemistry, Ayurveda & Allied Sciences
S. P. College Campus, Tilak Road, PUNE - 411030. India
Tel. : 020 - 24324324. Email : bhidefoundation@rediffmail.com

Date :

DATE: 24/09/2011

TO,
DR. SANTOSH S. MULIK
BHARATI VIDYAPEETH DEEMED UNIVERSITY
COLLEGE OF AYURVED.
DHANKAWADI
PUNE-411043

DEAR SIR,

THIS HAS REFERENCE TO THE SUBJECT MATTER. THE GHRUTA SAMPLE PROVIDED BY YOU WAS ANALYSED AS PER YOUR REQUIREMENT. THE DETAILS ARE AS FOLLOWAS:

SR.NO	TEST	RESULT	STANDARD AS PER PFA
1	TOTAL FAT CONTENT	82.91%	NOT LESS THAN 85%
2	TOTAL ASH CONTENT	0.69%	NOT AVAILABLE
3	SAPONIFICATION VALUE	231.70	225-235
4	IODINE VALUE	52.08	50-55
5	ACID VALUE	0.38	NMT 0.5
6	REFRACTIVE INDEX	1.446	1.453-1.456
7	ADULTERATION OF VANASPATI GHEE	NEGATIVE	NEGATIVE

IN CASE OF ANY QUERIES REGARDING THE RESULTS PLEASE FEEL FREE TO CONTACT US BACK.

FOR LATE PRIN. B. V. BHIDE FOUNDATION

MANGESH TEMBHURNE.

Late Prin BV Bhide Foundation
for Education and Research
in Chemistry

Figure 13 – FUNGAL TEST CERTIFICATE

A. S. Bhave
Hon. Director

Shikshana Prasaraka Mandali's
Late Prin. B. V. Bhide Foundation
For Education & Research In Chemistry, Ayurveda & Allied Sciences
S. P. College Campus, Tilak Rnad, PUNE - 411030. India
Tel. : 020 - 24324324. Email : bhidefoundation@rediffmail.com

Date : 15/5/15

To,

Dr. Santosh Shivaji Mulik
Ph. D (Scholar)
Bharati Vidyapeeth college of Ayurved
Pune.

Sub: Report of analysis of Goghruta sample provided by you

The samples provided by you were analyzed as per your requirements and the details of the samples were as follows.

Sample Name: - Goghruta

Sr.No.	Test Name	Results Obtained	Limits As per WHO Guidelines
1	Total Fungal count (CFU/ml)	2	Mould Propagules Max 10^3

All the tests were performed according to standard methods. In case of any queries regarding the results please feel free to contact us back.

Thanking You

Yours Sincerely,
15/5/15
A.S. Bhave
Hon. Director

(Note:-This report reflects our findings at the time and place of testing. This report is for technical support and Late.Prin. B.V. Bhide Foundation lab will not involve in any legal matter arising from this report)

MOISOL EYE DROP

Used in 50 patients of control group 1.

It is clear to slightly opalescent colourless, slightly viscous solution.

Moisol Eye Drops of Batch No. MSW2051 were purchased from the market for this clinical trial.

Contents-

- Hydroxy propyl methylcellulose 0.7% w/v
- Borax 0.19%w/v
- Boric acid 0.19%w/v
- Sodium chloride 0.45%w/v
- Pottasium chloride 0.37%w/v
- Benzalkonium chloride 0.01%w/v
  (As Preservative)
- Sterile isotonic aqueous vehicle…..q.s.

Uses-

- It is used as artificial tears to prevent damage to the cornea

Figure 14 – Moisol eye drop

ANTIREFLECTION COATING GLASSES

Used in 50 patients of Control group 2.

The visual benefits of lenses with anti-reflective coating include sharper vision with less glare when driving at night and **greater comfort during prolonged computer use (compared with wearing eyeglass lenses without AR coating).**

Figure 15 – ARC glasses

AŚCOTANA

Aścotana is one of the most important procedure among all the Kriyakalpas. Ācarya Vāgbhatā quoted that it is Aadya Upakrama in all the eye diseases.

STANDARD OPERATIVE PROCEDURE FOR AŚCOTANA

- Patient should take position in which he should lie down on his back. The doctor has to open the eyes of the patient with his left hand. And has to put the drops from the bottle with his right hand from 2 Anguli (inch) height. The Goghuta eye drops packed in sterilized bottle, 4 drops were put into eyes from 2 Anguli (Inch) height. The medicine should kept in the eyes for 100 Matra kalas, afterwards eyes should be cleaned with Lukewarm water (Mrudu sweda), and adviced not to see the bright things.
- In this clinical trial Goghṛuta was packed in sterilized bottle and given to patients.
- The patients were shown the above procedure and told to perform it at home.
- For liquification of Ghruta the patient was advised to put ghruta bottle in hot water for sometime. After liquefying the ghruta, it should be immediately used. The temperature of ghruta should be comfortable i.e not too hot. This also helped in better absorption and better distribution.

METHODOLOGY

Entire study is based on clinical findings and patient narrations.

Selection of the patients:

The patients suffering from Computer Vision Syndrome were selected for the project. Patients coming to the Śālākyataṃtra (Netrarog) Out patient department who meet with the inclusion criteria were included in the study and an informed written consent was obtained from the subjects included.

Details of study subjects and controls:

Number of patient selected – Total 150 patients were selected having signs and symptoms of CVS. 21 patients were dropped out due to various reasons during this clinical study. Patients were randomly divided into three groups with 50 patients in each group.

a) In Trial group, Goghṛuta Aścotana was done in 50 patients. There are 2 control groups in this study containing 50 patients in each group.

b) In 1st control group, Moisol eye drop was instilled 4 drops evening in 50 Patients.

c) In 2nd control group, Anti Reflection Coating glasses were given other than sleeping time in 50 patients.

This clinical trial was included 171 patients but 21 patients were dropped out due to various reasons during this clinical study period.

Inclusion criteria:-

- Patients working more than 6 hrs/ day in front of computer & suffering from Computer Vision Syndrome were selected.
- Patients from age group 18 to 45 were selected.
- Selection was irrespective of sex, religion & socioeconomic status.

Exclusion criteria:

- Patients suffering from any associated ocular diseases except refractive error were excluded.
- Patients suffering from ocular surface disorders except Dry eye syndrome were excluded.

Type of study: Randomized clinical control trial

Place of work: Patients from daily OPD of Śālākyataṃtra Department of our Āyurved Hospital.

Duration of treatment:

Duration of treatment was 60 days and only follow up on 90^{th}& 120^{th} day.

Follow up:

Follow up was done on 0^{th}, 15^{th}, 30^{th}, 45^{th}, 60^{th}, 90^{th}& 120^{th} day.

Table 6 - OBSERVATION TABLE - 1

Sr. No.	Parameters	0		15th		30th		45th		60th		90th		120th	
		Rt	Lt	Rt	Lt	Rt	Lt	Rt	Lt	Rt	Lt	Rt	Lt	Rt	Lt
1.	Hedache														
2	Dryness														
3	Eye Fatigue														
4	Redness														
5	Burning Sensation														
6	Itching														

Observations were noted in tabulated form according to signs and symptoms with gradations as follows:

0 – Normal

1/+ - Mild

2/++ - Moderate

3/+++ - Severe

Table 7 - OBSERVATION TABLE – 2

Sr. No.	TEST	0th		30th		60th		90th		120th	
		Rt	Lt	Rt	Lt	Rt	Lt	Rt	Lt	Rt	Lt
1.	Tear Film Break Up Time (in secs)										
2.	Schirmer's Test I (in mm)										

Table 8 - CRITERIA FOR ASSESMENTS

Sr. No.	Parameters	Criteria	Result/ Grade
1.	Hedache	Normal- No headache Mild- Occasional headache Moderate-Irregular attacks of frequent hedache Severe- Regular hedache	0 1 2 3
2.	Dryness of Eyes	No Dryness - >15 mm wetting Mild – 10mm-15mm wetting Moderate-5mm -10mm wetting Severe - < 5mm wetting	0 1 2 3
3.	Eye fatigue	Normal-After more than 6 hours of near work Mild- After 4-6 hours of near work Moderate- After 2- 4 hours of near work Severe- Before 2 hours of near work	0 1 2 3
4.	Redness	Normal-After more than 6 hours of near work Mild- After 4-6 hours of near work Moderate- After 2- 4 hours of near work Severe- Before 2 hours of near work	0 1 2 3
5.	Burning sensation	No burning sensation Mild- Incontinuous, tolerable Moderate- Continuous, tolerable Severe- Continuous, Intolerable	0 1 2 3
6.	Itching	Normal - No feeling of itching Mild-Occasionally present & very mild feeling of itching Moderate-Frequently present & moderate feeling of itching Severe-feeling of itching all the time & severe	0 1 2 3

PLAN OF STUDY

A detailed history was taken in each case, followed by thorough general, systemic and ocular examination as per the proforma attached subsequently. I submitted all the patients of both group to slit lamp examination and performed two specific tests in each case.

- Schirmer Test – I
- Tear Film Break Up Time Test

SLIT LAMP EXAMINATION

- Inspection of the marginal tear strip to see irregular width of the strip of frank discontinuation, which strongly suggests aqueous tear deficiency or lipid abnormality.
- To see increased debris floating in the precorneal tear film representing desquamated epithelium.
- To observe viscous mucin threads in the inferior fornix which indicate increased lipid contamination of the mucus layer facilitated by decreased tear flow.
- Inspection of the fornices for symblepharon etc.

SCHIRMER TEST 1

In Schirmer Test, the patient was seated comfortably in a dimly light room in chair with head straight. It was ensured that no fan was on in the room at the time of test.

The test was then performed by No: 41 Whatman filter paper strips 5mm wide and 30mm long partially folded 5mm from one end at 90 degree.

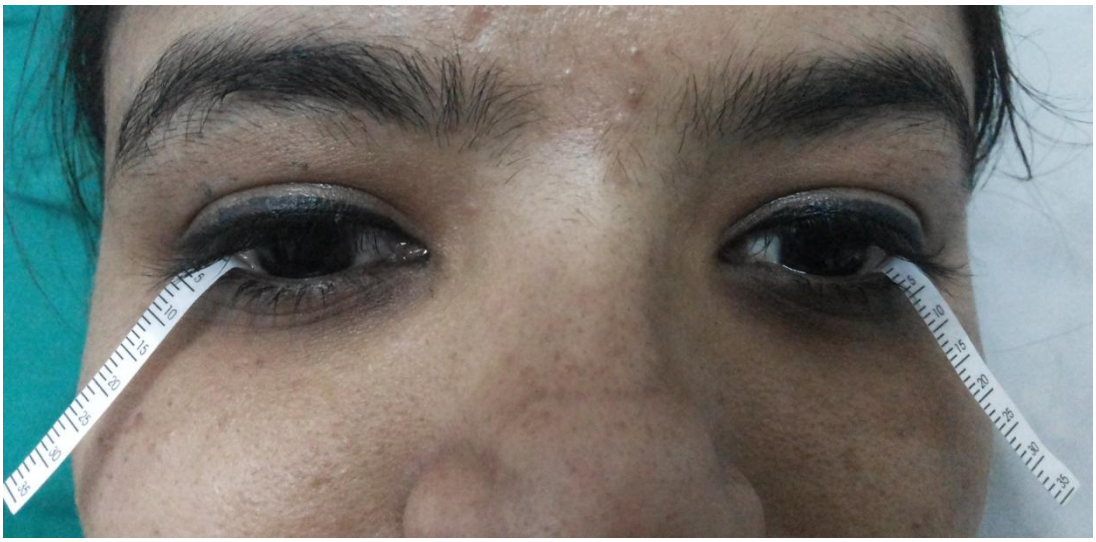
The folded short end was gently placed in the lower conjunctival fornix at the junction of middle and lateral one third of lower lid and the patient was advised to look straight ahead and to keep eyes open. Blinking was permitted. At the end of the 5 minutes, the strips were removed and two minutes later the amount of wetting of the strips from the folded ends was measured with a millimeter scale. If tear fluid failed to diffused over the lid margin along the strip within 2 minutes, it was moved to another site within the sac and time was recorded. This is a modification of the Schirmer 1

test, to obviate false positive results. If one or both strips were completely wetted before 5 minutes passed, they were replaced by new strips.

The Schirmer test was used to determine the quantitative tear formation. Normal range of 15 to 25 mm. Below 15mm and upto 5mm it is border line and less than 5mm wetting definitely abnormal.

Figure 16 – Schirmer Test 1 Strip

Figure 17 – Schirmer Test 1 performed on Patient



TEAR FILM BREAK UP TIME

T.F.B.U.T was used to measure the quality of the tear film. This test was done as follow. A moistened fluorescein strip was applied to the inferior temporal bulbar conjunctiva. Patients were instructed to blink several times to facilitate an even distribution of fluorescein. The patient was then positioned for slit lamp examination and asked to stare directly ahead without blinking or holding the lids after one complete blink. The tear film was then scanned through a cobalt blue filtered light by magnification and broad vertical beam. A stopwatch was used to measure the interval between the last complete blink and the first appearance of a randomly distributed dry spot, T.F.B.U.T. Three consecutive readings were taken in each eye and the mean value of these readings were considered above 10 seconds as normal and less than 10 seconds as cases of dry eyes .

Figure 18 – A dry spot caused by tear film break up

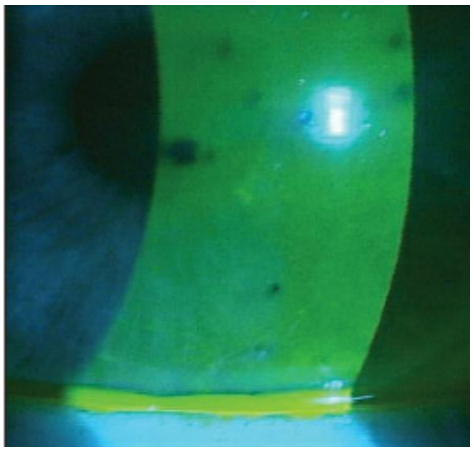


Figure 19 – Fluorescein Strip

OBSERVATIONS & RESULTS

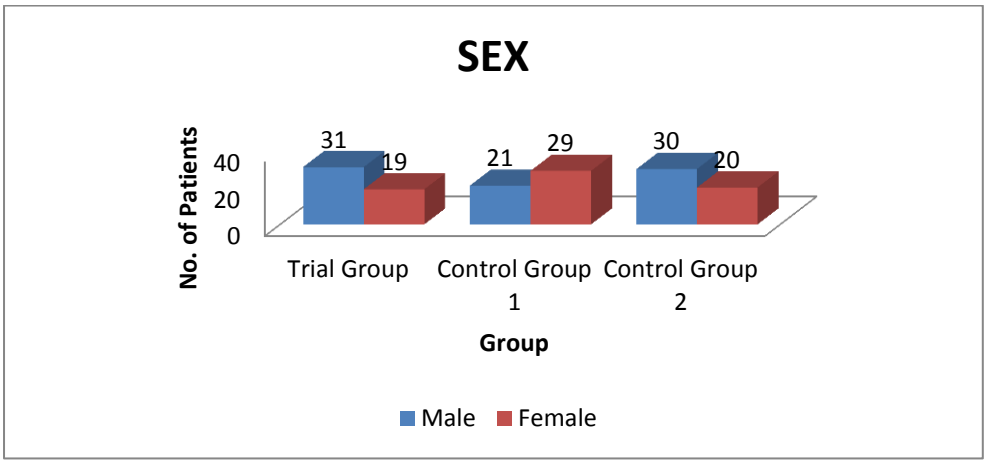
- **Observations**
- **Statistical analysis & Results**

OBSERVATIONS AND RESULTS

Table 9 - Number and percentagewise distribution of patients according Sex

SEX	Trial Group		Control Group 1		Control Group 2	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Male	31	62	21	42	30	60
Female	19	38	29	58	20	40
TOTAL	50	100	50	100	50	100

Graph 1 - Distribution of patients according Sex



In Trial Group, males were 62% and females were 38%.

In Control Group 1, 42% were males and 58% were females.

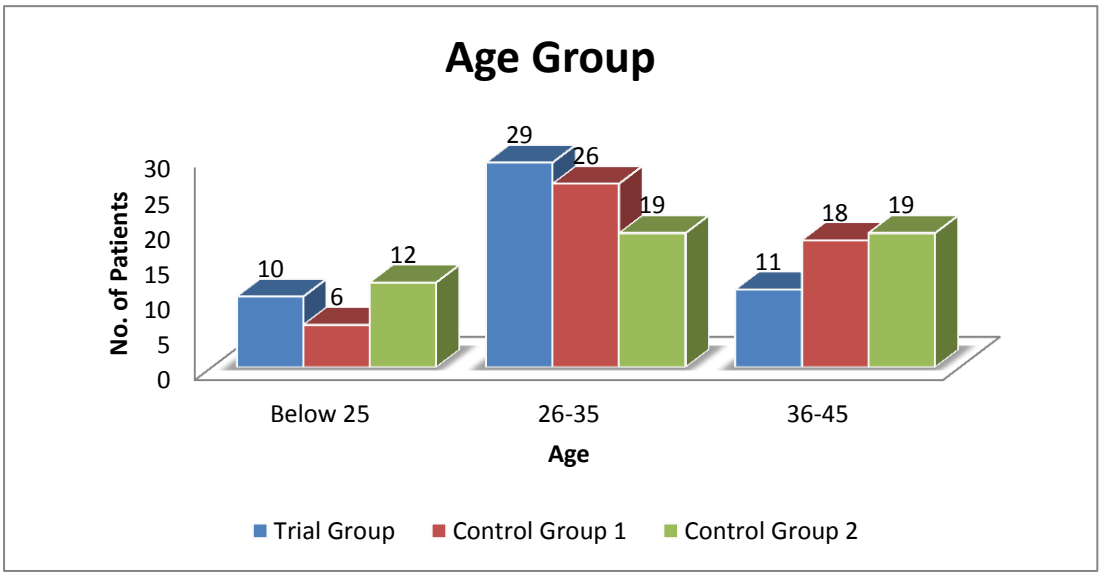
In Control Group 2, 60% were males and 40% were females

The incidence of Shushkaashipak (Dry eye syndrome) was observed higher in males than females in Trial Group and Control Group 2 but in Control Group 1 incidence of females are more than males.

Table 10 - Number and percentagewise distribution of patient according Age

Age	Trial Group		Control Group 1		Control Group 2	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Below 25	10	20	6	12	12	24
26-35	29	58	26	52	19	38
36-45	11	22	18	36	19	38
TOTAL	50	100	50	100	50	100

Graph 2 - Distribution of patients according Age



In Trial Group, 20% patients were noted below 25 years. Between 26-35 years, there were 58% patients noted. Between 36-45 years there were 22% patients.

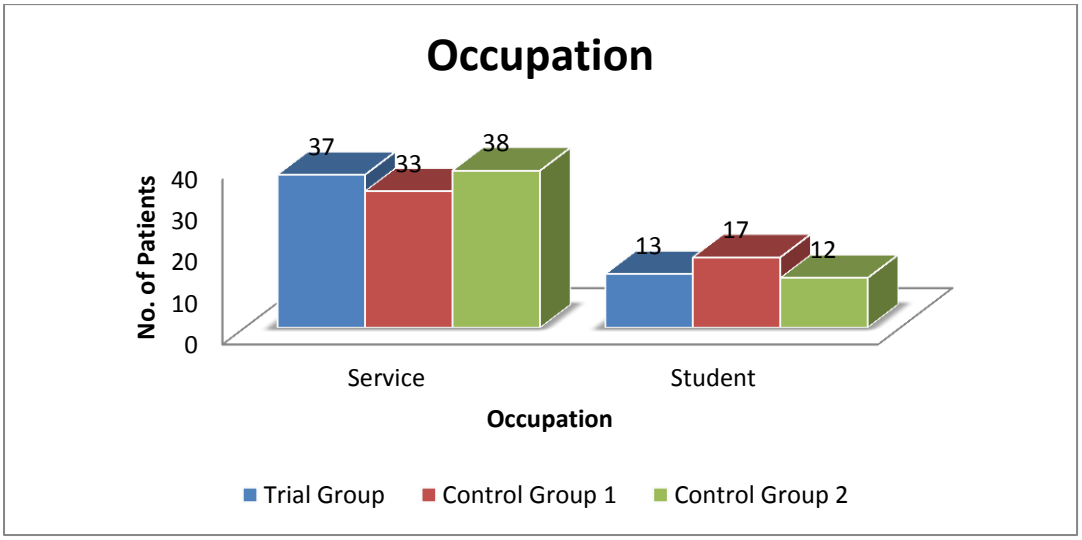
In Control Group 1, Below 25 yrs. there were 12% patients. 52% patients were noted between 26-35 years. 36% patients were noted between 36-45 years.

In Control Group 2, 24% patients were noted below 25 years. Between 26-35 years, there were 38% patients noted. Between 36-45 years there were 38% patients. It shows that the incidence of Computer Vision Syndrome was observed higher in the age group of 26 to 45 years and minimum below the age of 25 years.

Table 11 - Number and percentagewise distribution of patients according Occupation

Occupation	Trial Group		Control Group 1		Control Group 2	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Service	37	74	33	66	38	76
Student	13	26	17	34	12	24
TOTAL	50	100	50	100	50	100

Graph 3- Distribution of patients according Occupation



In Trial Group, 74% patients were doing service and 26% patients were students.

In Control Group 1, 66% patients were from service sector and 34% patients were students.

In Control Group 2, 76% patients were doing service and 24% patients were students.

A higher prevalence seen in service sector than students probably because of more exposure to computer, more working hours in front of computers.

HEDACHE

Table 12 - Effect on hedache in 3 groups

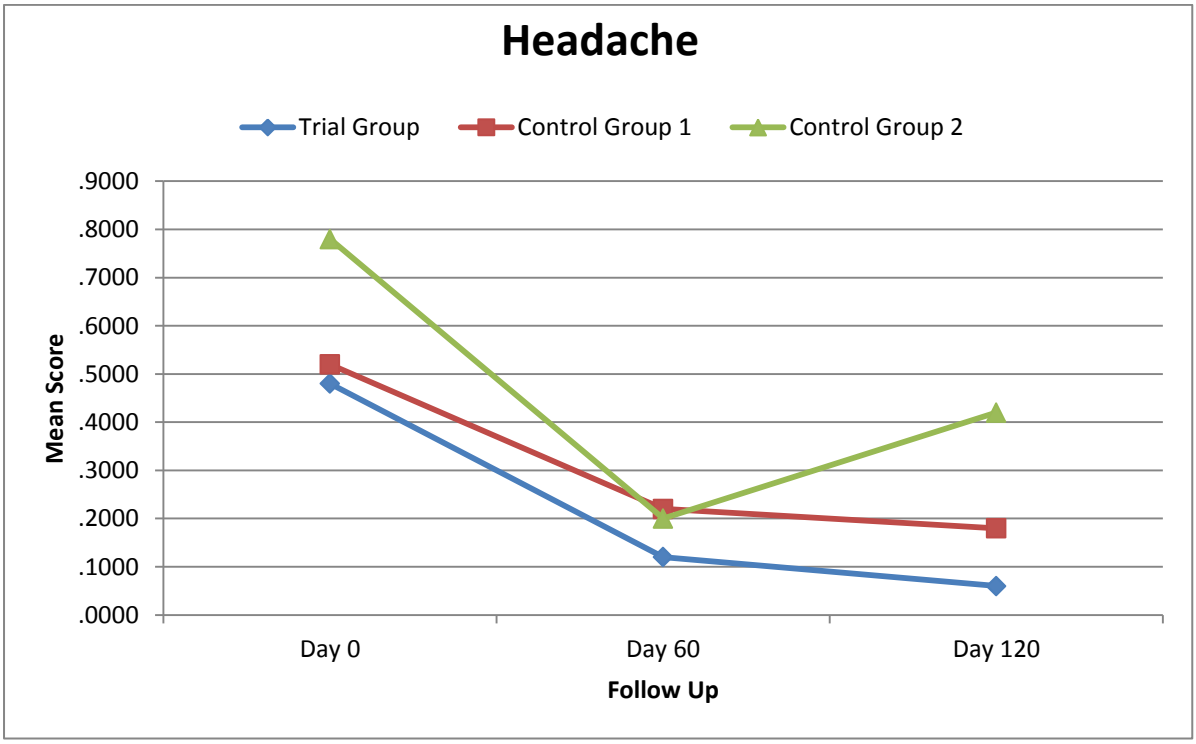
Headache	Mean			Wilcoxon Signed Rank W	P-Value	% Effect	Result
	Day 0	Day 60	Day 120				
Trial Group	.4800	.1200	.0600	-4.243[a]	.000	75.00	Significant
Control Group 1	.5200	.2200	.1800	-3.441[a]	.001	57.70	Significant
Control Group 2	0.78	0.2	0.42	-5.209[a]	.000	74.40	Significant

In trial group, mean score is decreased from 0.48 to 0.12 after treatment i.e. 75% effect is observed, also P-Value is less than 0.05 the effect is significant on headache. Furthermore recurrence is not significantly observed at day 120.

In control group 1, mean score is decreased from 0.52 to 0.22 after treatment i.e. 57.70% effect is observed, also P-Value is less than 0.05 the effect was significant on headache. Furthermore recurrence is significantly observed at day 120.

In control group 2, mean score is decreased from 0.78 to 0.20 after treatment i.e. 74.40% effect is observed, also P-Value is less than 0.05 the effect is significant on headache. Furthermore recurrence is significantly observed at day 120.

Graph 4 – Effect on hedache according to Mean



Graph 5 - Percentagewise effect on Hedache in 3 groups

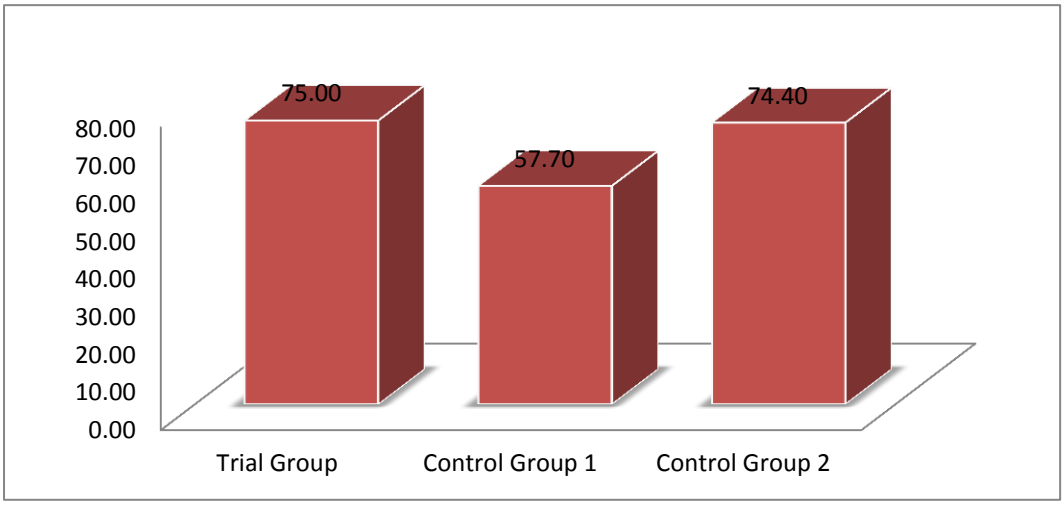


Table 13- Classification of patients according to Gradation of Hedache

Trial Group (Goghṛuta Aścotana)

Hedache Gradation	0th day	60th day	120th day
0	14	40	29
1	33	10	21
2	3	0	0
3	0	0	0

Control Group 1 (Moisol Eye Drop)

Hedache Gradation	0th day	60th day	120th day
0	26	38	41
1	21	12	9
2	3	0	0
3	0	0	0

Control Group 2 (ARC glasses)

Hedache Gradation	0th day	60th day	120th day
0	27	44	47
1	22	6	3
2	1	0	0
3	0	0	0

In Trial Group, before treatment 14 patients have no hedache, 33 patients have mild & 3 patients have moderate degree of hedache. On 60th day, 40 patients are symptomless and 10 patients have mild degree of hedache. On 120th day, 29 patients have no hedache & 21 patients have mild degree of hedache.

In Control Group 1, on 0th day, 26 patients have no hedache, 21patients have mild & 3 patients have moderate degree of hedache. On 60th day, 38 patients are symptomless and 12 patients have mild degree of hedache. On 120th day, 41 patients have no hedache & 9 patients have mild degree of hedache.

In control Group 2, it was observed that, 27 patients have no hedache, 22 patients have mild & 1 patient has moderate degree of hedache. On 60th day, 44 patients are symptomless and 6 patients have mild degree of hedache. On 120th day, 47 patients have no hedache & 3 patients have mild degree of hedache.

Interpretation-

All 3 groups have significant effect observed. But Goghṛuta Aścotana is more significant than Moisol eye drop & ARC glasses. ARC glasses are more significant than Moisol eye drop. Recurrence is not significantly observed in Trial Group & significantly observed in Control Group 1 & Control Group 2.

DRYNESS IN EYES

Table 14-Effect on Dryness in eyes in 3 groups

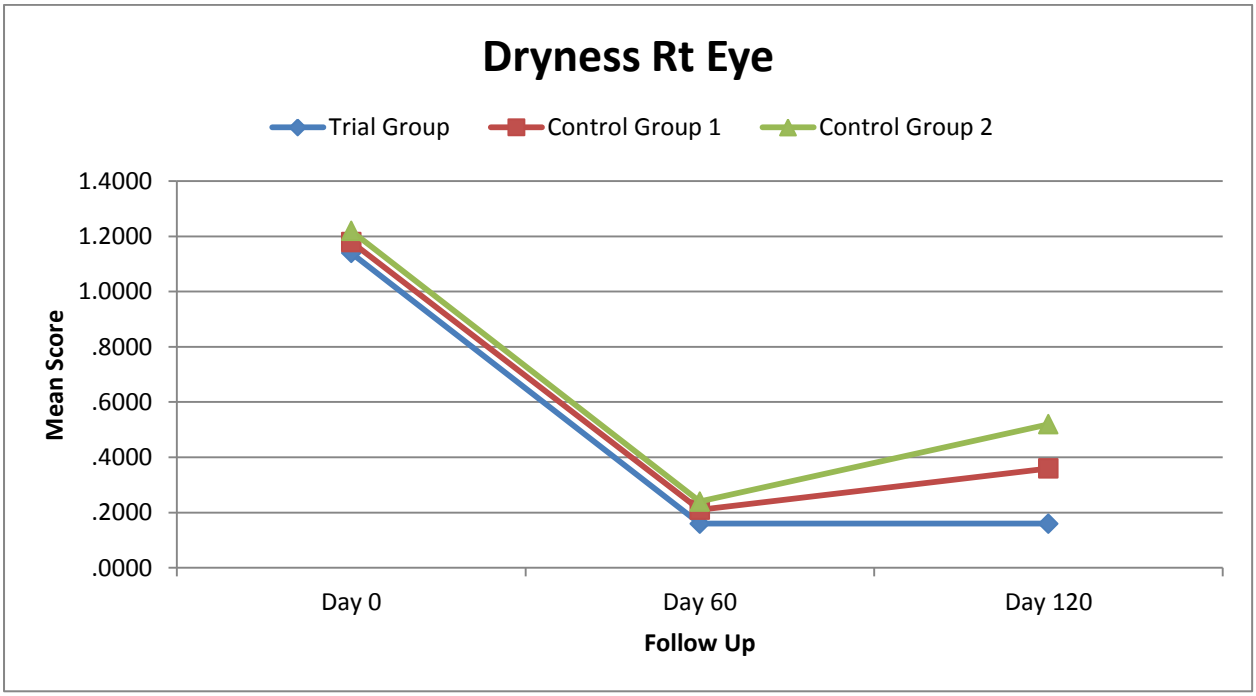
Dryness in eyes		Mean			Wilcoxon Signed Rank W	P - Value	% Effect	Result
		Day 0	Day 60	Day 120				
Trial Group	Right Eye	1.1400	.1600	.1600	-6.726a	.000	86.00	Significant
	Left Eye	1.1400	.1000	.1600	-6.814a	.000	91.20	Significant
Control Group 1	Right Eye	1.1800	.2100	.3600	-6.019a	.000	82.20	Significant
	Left Eye	1.1000	.1500	.3400	-6.126a	.000	86.40	Significant
Control Group 2	Right Eye	1.22	0.24	0.52	-5.746a	.000	80.30	Significant
	Left Eye	1.06	0.16	0.48	-6.285a	.000	84.90	Significant

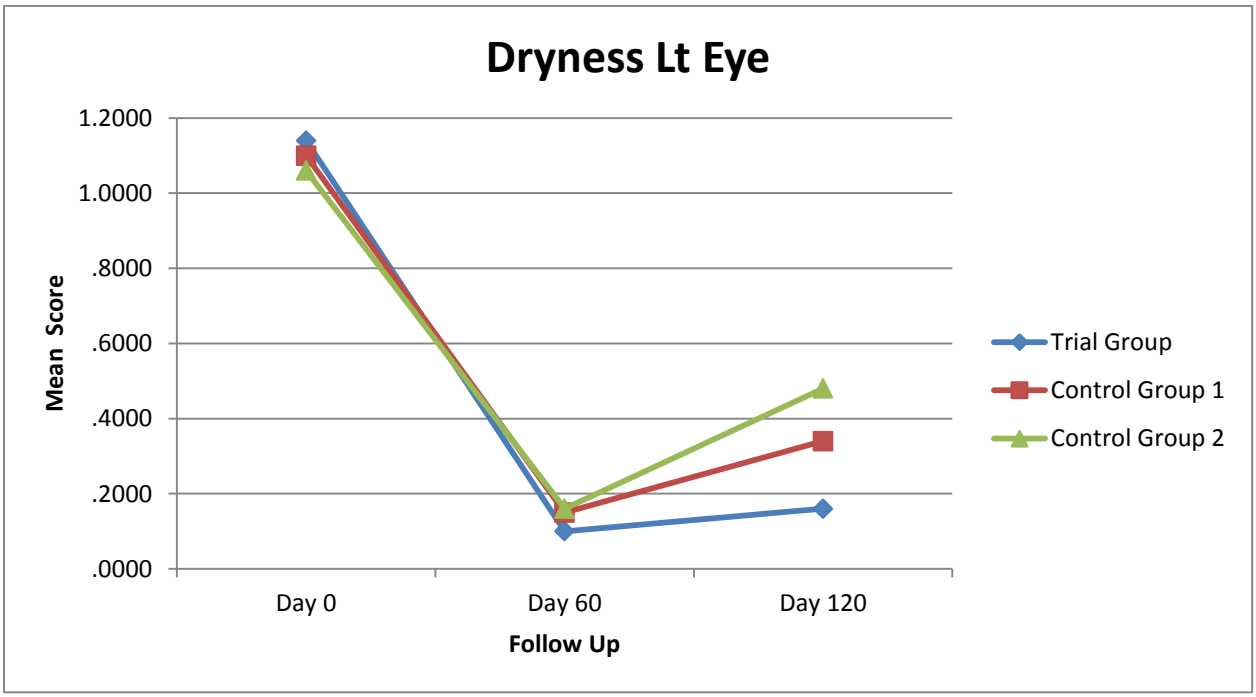
In trial group, mean score is decreased from 1.14 to 0.16 after treatment i.e. 86% effect is observed in right eye and mean score is decreased from 1.14 to 0.10 after treatment i.e. 91.20 % effect is observed in left eye, also P-Value is less than 0.05 the effect is significant on Dryness. Furthermore recurrence is not significantly observed at day 120 in both eyes.

In control group 1, mean score is decreased from 1.18 to 0.21 after treatment i.e. 82.20% effect is observed in right eye and mean score is decreased from 1.10 to 0.15 after treatment i.e. 86.40 % effect is observed in left eye, also P-Value is less than 0.05 the effect is significant on Dryness. Furthermore recurrence is significantly observed at day 120 in both eyes

In control group 2, mean score is decreased from 1.22 to 0.24 after treatment i.e. 80.30% effect is observed in right eye and mean score is decreased from 1.06 to 0.16 after treatment i.e. 84.90 % effect is observed in left eye , also P-Value is less than 0.05 the effect is significant on Dryness. Furthermore recurrence is significantly observed at day 120 in both eyes

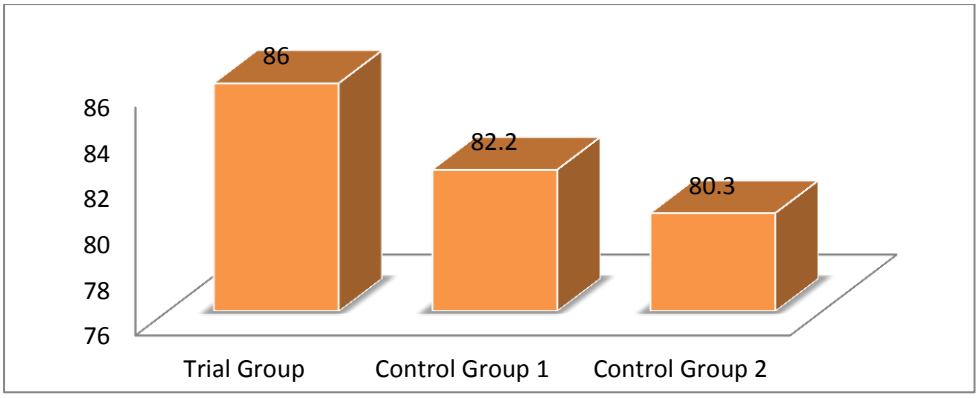
Graph 6 – Effect on Dryness in eyes according to Mean





Graph 7 - Percentagewise effect on Dryness in eyes in 3 groups

RIGHT EYE



LEFT EYE

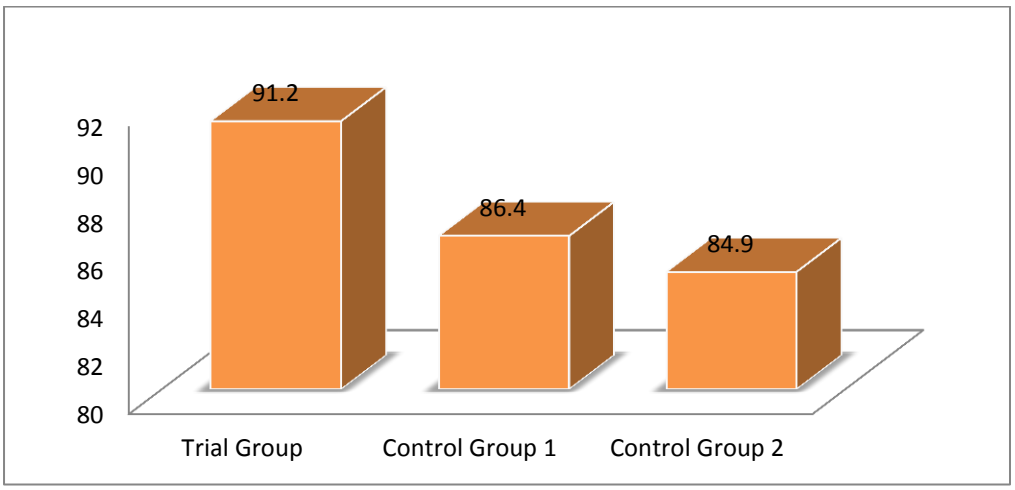


Table 15-Classification of patients according to Gradation of Dryness in eyes

Trial Group (Goghṛuta Aścotana)

Dryness Gradation	0th day		60th day		120th day	
	Rt	Lt	Rt	Lt	Rt	Lt
0	0	0	42	45	42	42
1	43	43	8	5	8	8
2	7	7	0	0	0	0
3	0	0	0	0	0	0

Control Group 1 (Moisol Eye Drop)

Dryness Gradation	0th day		60th day		120th day	
	Rt	Lt	Rt	Lt	Rt	Lt
0	1	1	36	39	32	33
1	39	43	14	11	18	17
2	10	6	0	0	0	0
3	0	0	0	0	0	0

Control Group 2 (ARC glasses)

Dryness Gradation	0th day		60th day		120th day	
	Rt	Lt	Rt	Lt	Rt	Lt
0	0	0	38	32	24	26
1	39	47	12	18	26	24
2	11	3	0	0	0	0
3	0	0	0	0	0	0

Rt Eye

In Trial Group, before treatment, 43 patients have mild & 7 patients have moderate degree of dryness in eyes. On 60th day, 42 patients are symptomless and 8 patients have mild degree of dryness in eyes. On 120th day, 42 patients have no dryness in eyes & 8 patients have mild degree of dryness in eyes.

In Control Group 1, on 0th day, 1 patient has no dryness in eyes, 39 patients have mild & 10 patients have moderate degree of dryness in eyes. On 60th day, 36 patients are symptomless and 14 patients have mild degree of dryness in eyes. On 120th day, 32 patients have no dryness in eyes & 18 patients have mild degree of dryness in eyes.

In Control Group 2, on 0th day it was observed that 39 patients have mild & 11 patients has moderate degree of dryness in eyes. On 60th day, 38 patients are symptomless and 12 patients have mild degree of dryness in eyes. On 120th day, 24 patients have no dryness in eyes & 26 patients have mild degree of dryness in eyes.

Lt Eye

In Trial Group, before treatment, 43 patients have mild & 7 patients has moderate degree of dryness in eyes. On 60th day, 45 patients are symptomless and 5 patients have mild degree of dryness in eyes. On 120th day, 42 patients have no dryness in eyes & 8 patients have mild degree of dryness in eyes.

In Control Group 1, on 0th day, 1 patient has no dryness in eyes, 43 patients have mild & 6 patients have moderate degree of dryness in eyes. On 60th day, 39 patients are symptomless and 11 patients have mild degree of dryness in eyes. On 120th day, 33 patients have no dryness in eyes & 17 patients have mild degree of dryness in eyes.

In Control Group 2, it was observed that, 47 patients have mild & 3 patients have moderate degree of dryness in eyes. On 60th day, 32 patients are symptomless and 8 patients have mild degree of dryness in eyes. On 120th day, 26 patients have no dryness in eyes & 24 patients have mild degree of dryness in eyes.

Interpretation :

All 3 groups have significant effect observed. But Goghṛuta Aścotana is more significant than Moisol eye drop & ARC glasses. Moisol eye drop is more significant than ARC glasses. Recurrence is not significantly observed in Trial Group but significantly observed in Control Group 1 & Control Group 2 on 120th day.

EYE FATIGUE

Table 16 - Effect on Eye Fatigue in 3 groups

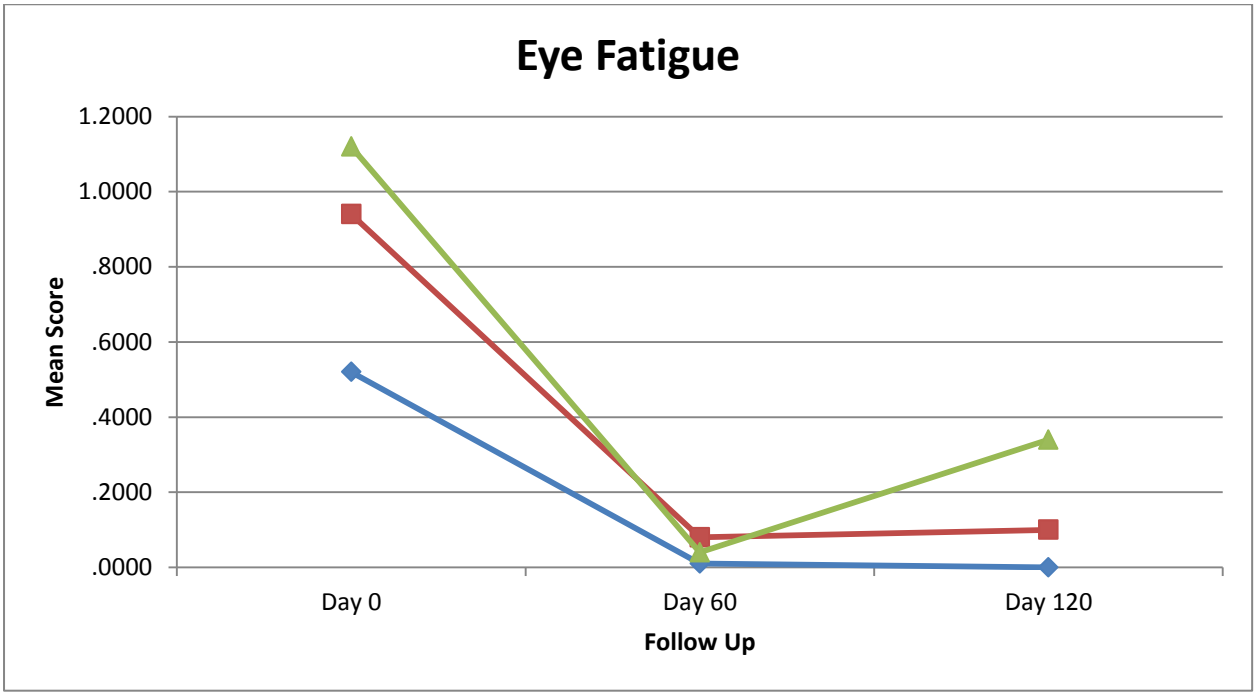
Eye Fatigue	Mean			Wilcoxon Signed Rank W	P-Value	% Effect	Result
	Day 0	Day 60	Day 120				
Trial Group	.5200	.0100	.0000	-5.000[a]	.000	98.10	Significant
Control Group 1	.9400	.0800	.1000	-6.410[a]	.000	91.50	Significant
Control Group 2	1.12	0.04	0.34	-6.591[a]	.000	96.40	Significant

In trial group, mean score is decreased from 0.52 to 0.01 after treatment i.e. 98.10% effect is observed, also P-Value is less than 0.05 the effect is significant on Eye Fatigue. Furthermore recurrence is not significantly observed at day 120.

In control group 1, mean score is decreased from 0.94 to 0.08 after treatment i.e. 91.50% effect is observed, also P-Value is less than 0.05 the effect was significant on Eye Fatigue. Furthermore recurrence is not significantly observed at day 120.

In control group 2, mean score is decreased from 1.12 to 0.04 after treatment i.e. 96.40% effect is observed, also P-Value is less than 0.05 the effect is significant on Eye Fatigue. Furthermore recurrence is significantly observed at day 120.

Graph 8 – Effect on Eye Fatigue according to Mean



Graph 9 – Percentagewise effect on Eye Fatigue in 3 groups

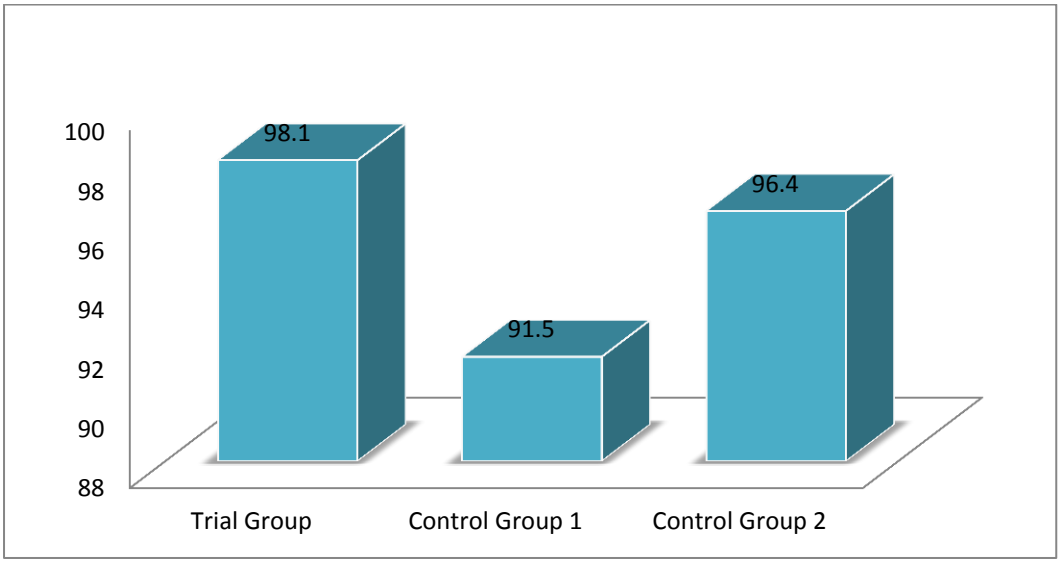


Table 17 – Classification of patients according to Gradation of Eye Fatigue

Trial Group (Goghṛuta Aścotana)

Eye Fatigue Gradation	0th day	60th day	120th day
0	26	49	50
1	24	1	0
2	0	0	0
3	0	0	0

Control Group 1 (Moisol Eye Drop)

Eye Fatigue Gradation	0th day	60th day	120th day
0	5	46	45
1	43	4	5
2	2	0	0
3	0	0	0

Control Group 2 (ARC glasses)

Eye Fatigue Gradation	0th day	60th day	120th day
0	1	49	33
1	42	1	17
2	7	0	0
3	0	0	0

In Trial Group, before treatment 26 patients have no Eye Fatigue, 24 patients have mild degree of Eye Fatigue. On $60^{t\ h}$ day, 49 patients have no eye fatigue and 1 patient has mild degree of Eye Fatigue. On 120^{th} day, all 50 patients have no eye fatigue.

In Control Group 1, on 0^{th} day, 5 patients have no Eye Fatigue, 43 patients have mild & 2 patients have moderate degree of Eye Fatigue. On 60^{th} day, 46 patients have no eye fatigue and 4 patients have mild degree of Eye Fatigue. On 120^{th} day, 45 patients have no Eye Fatigue & 5 patients have mild degree of Eye Fatigue.

In control Group 2, it was observed that, 1 patient has no Eye Fatigue, 42 patients have mild & 7 patients have moderate degree of Eye Fatigue. On 60^{th} day, 49 patients were symptomless and 1 patient has mild degree of Eye Fatigue. On 120^{th} day, 33 patients have no Eye Fatigue & 17 patients have mild degree of Eye Fatigue.

Interpretation :

All 3 groups have significant effect observed. But Goghṛuta Aścotana is more significant than Moisol eye drop & ARC glasses. ARC glasses are more significant than Moisol eye drop. Recurrence is not significantly observed in Trial Group & Control Group 1 but significantly observed in Control Group 2 on 120^{th} day.

REDNESS IN EYES

Table 18 - Effect on Redness in eyes in eyes in 3 groups

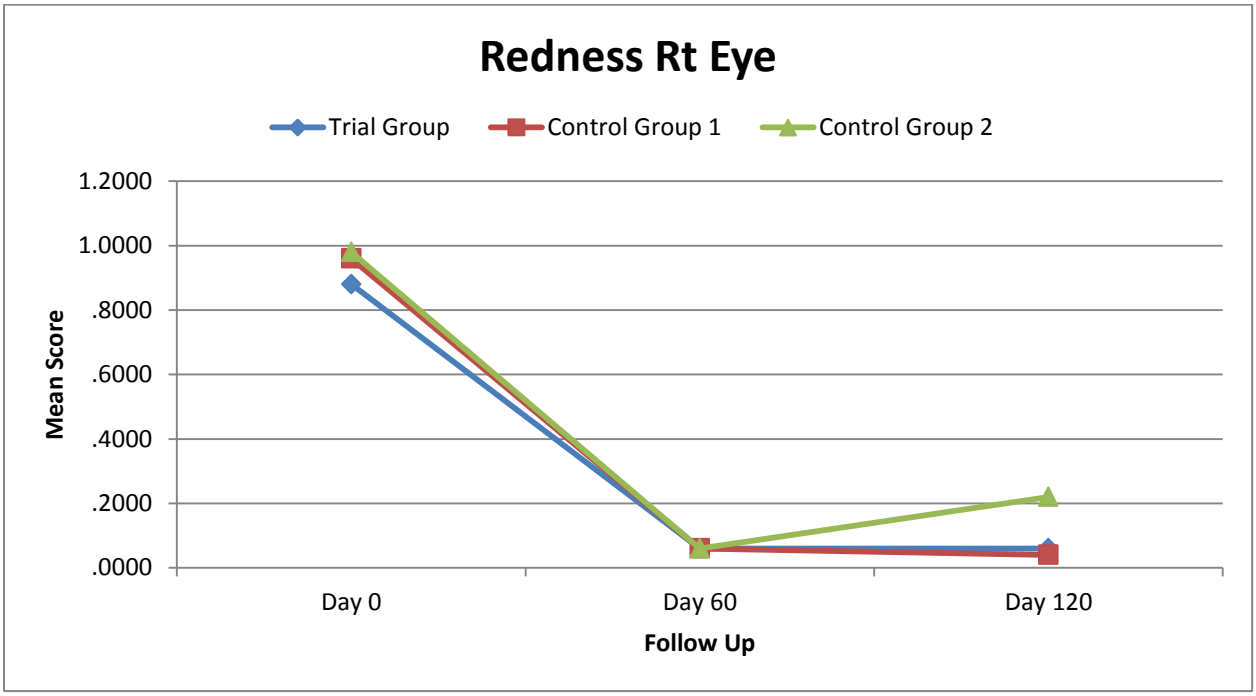
Redness		Mean			Wilcoxon Signed Rank W	P-Value	% Effect	Result
		Day 0	Day 60	Day 120				
Trial Group	Right Eye	.8800	.0600	.0600	-6.105[a]	.000	93.20	Significant
	Left Eye	.9200	.0600	.0600	-6.266[a]	.000	93.50	Significant
Control Group 1	Right Eye	.9600	.0600	.0400	-5.800[a]	.000	93.80	Significant
	Left Eye	.8800	.0600	.0400	-5.975[a]	.000	93.20	Significant
Control Group 2	Right Eye	0.98	0.06	0.22	-6.640[a]	.000	93.90	Significant
	Left Eye	0.96	0.02	0.24	-6.856[a]	.000	97.90	Significant

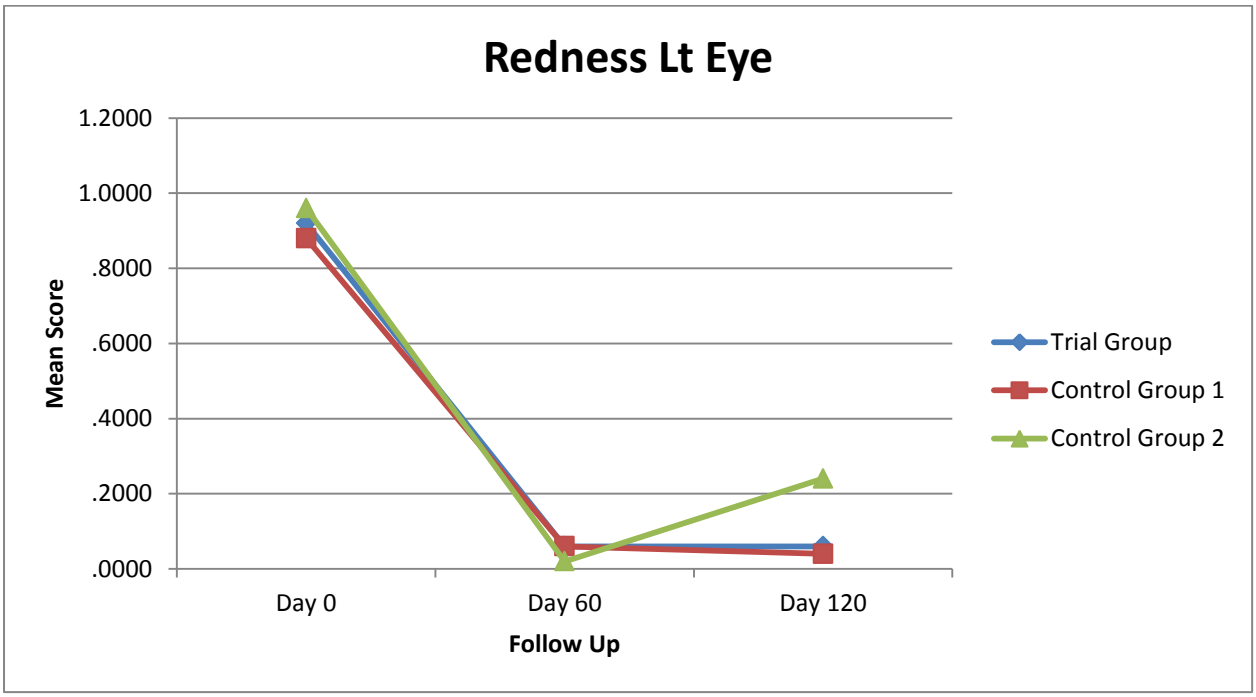
In trial group, mean score is decreased from 0.88 to 0.06 after treatment i.e. 93.20% effect is observed in right eye and mean score is decreased from 0.92 to 0.06 after treatment i.e. 93.50 % effect is observed in left eye , also P-Value is less than 0.05 the effect is significant on Redness. Furthermore recurrence is not significantly observed at day 120 in both eyes.

In control group 1, mean score is decreased from 0.96 to 0.06 after treatment i.e. 93.80% effect is observed in right eye and mean score is decreased from 0.88 to 0.06 after treatment i.e. 93.20 % effect is observed in left eye , also P-Value is less than 0.05 the effect is significant on Redness. Furthermore recurrence is significantly observed at day 120 in both eyes

In control group 2, mean score is decreased from 0.98 to 0.02 after treatment i.e. 93.90% effect is observed in right eye and mean score is decreased from 0.96 to 0.02 after treatment i.e. 97.90 % effect is observed in left eye , also P-Value is less than 0.05 the effect is significant on Redness. Furthermore recurrence is significantly observed at day 120 in both eyes

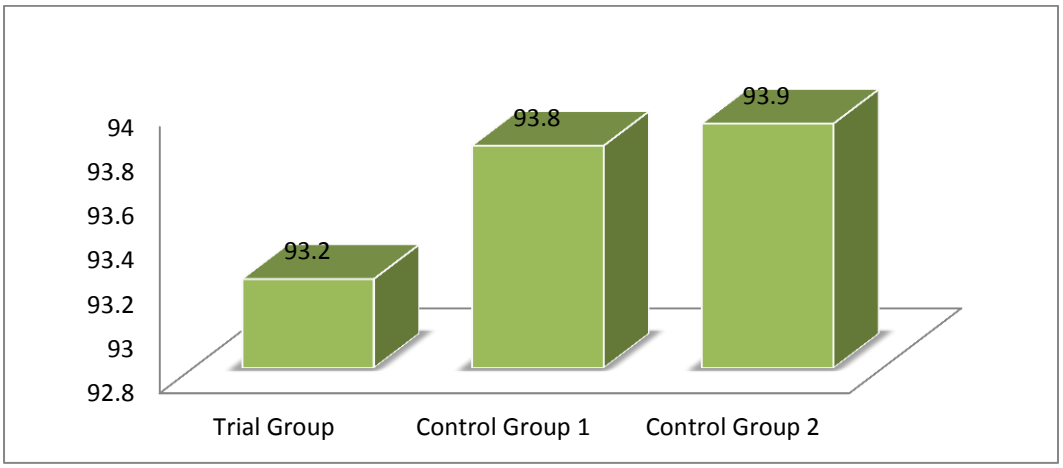
Graph 10 – Effect on Redness in eyes according to Mean





Graph 11 -Percentagewise effect on Redness in eyes in 3 groups

RIGHT EYE



LEFT EYE

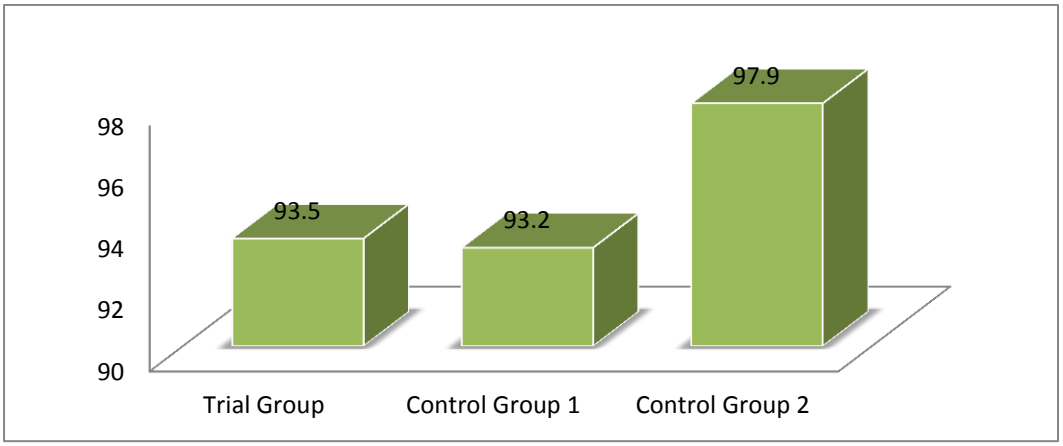


Table 19-Classification of patients according to Gradation of Redness in eyes

Trial Group (Goghṛuta Aścotana)

Redness Gradation	0th day		60th day		120th day	
	Rt	Lt	Rt	Lt	Rt	Lt
0	9	7	47	47	47	47
1	38	40	3	3	3	3
2	3	3	0	0	0	0
3	0	0	0	0	0	0

Control Group 1 (Moisol Eye Drop)

Redness Gradation	0th day		60th day		120th day	
	Rt	Lt	Rt	Lt	Rt	Lt
0	9	9	47	47	48	48
1	35	39	3	3	2	2
2	6	2	0	0	0	0
3	0	0	0	0	0	0

Control Group 2 (ARC glasses)

Redness Gradation	0th day		60th day		120th day	
	Rt	Lt	Rt	Lt	Rt	Lt
0	2	2	47	49	39	38
1	47	48	3	1	11	12
2	1	0	0	0	0	0
3	0	0	0	0	0	0

Rt Eye

In Trial Group, before treatment, 9 patients have no redness in eyes, 38 patients have mild & 3 patients have moderate degree of redness in eyes. On 60^{th} day, 47 patients were symptomless and 3 patients have mild degree of redness in eyes. On 120^{th} day, 47 patients have no redness in eyes & 3 patients have mild degree of redness in eyes.

In Control Group 1, on 0^{th} day, 9 patients have no redness in eyes, 35 patients have mild & 6 patients have moderate degree of redness in eyes. On 60^{th} day, 47 patients were symptomless and 3 patients have mild degree of redness in eyes. On 120^{th} day, 48 patients have no redness in eyes & 2 patients have mild degree of redness in eyes.

In control Group 2, on 0^{th} day it was observed that 2 patients have no redness in eyes, 47 patients have mild & 1 patient has moderate degree of redness in eyes. On 60^{th} day, 47 patients are symptomless and 3 patients have mild degree of redness in eyes. On 120^{th} day, 39 patients have no redness in eyes & 11 patients have mild degree of redness in eyes.

Lt Eye

In Trial Group, before treatment, 7 patients have no redness in eyes, 40 patients have mild & 3 patients have moderate degree of redness in eyes. On 60^{th} day, 47 patients were symptomless and 3 patients have mild degree of redness in eyes. On 120^{th} day, 47 patients have no redness in eyes & 3 patients have mild degree of redness in eyes.

In Control Group 1, on 0^{th} day, 9 patients have no redness in eyes, 39 patients have mild & 2 patients have moderate degree of redness in eyes. On 60^{th} day, 47 patients were symptomless and 3 patients have mild degree of redness in eyes. On 120^{th} day, 48 patients have no redness in eyes & 2 patients have mild degree of redness in eyes.

In control Group 2, on 0^{th} day it was observed that 2 patients have no redness in eyes, 48 patients have mild degree of redness in eyes. On 60^{th} day, 49 patients were symptomless and 1 patient has mild degree of redness in eyes. On 120^{th} day, 38 patients have no redness in eyes & 12 patients have mild degree of redness in eyes.

Interpretation :

All 3 groups have significant effect observed. There is no significant difference observed between 3 groups. Recurrence is not significantly observed in Trial Group but significantly observed in Control Group 1 & Control Group 2 on 120^{th} day.

BURNING SENSATION IN EYES

Table 20-Effect on Burning sensation in eyes in eyes in 3 groups

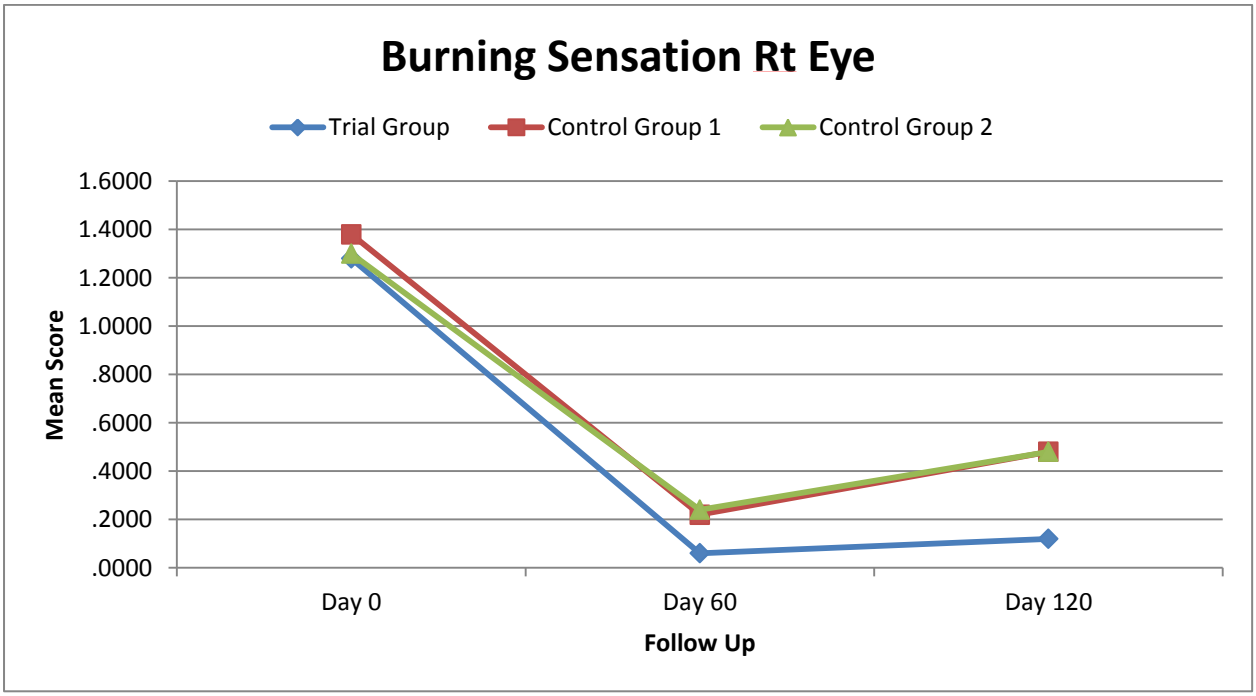
Burning sensation in eyes		Mean			Wilcoxon Signed Rank W	P-Value	% Effect	Result
		Day 0	Day 60	Day 120				
Trial Group	Right Eye	1.2800	.0600	.1200	-6.451[a]	.000	95.30	Significant
	Left Eye	1.1800	.0600	.1200	-6.621[a]	.000	94.90	Significant
Control Group 1	Right Eye	1.3800	.2200	.4800	-6.061[a]	.000	84.10	Significant
	Left Eye	1.1600	.1600	.4200	-5.514[a]	.000	86.20	Significant
Control Group 2	Right Eye	1.3	0.24	0.48	-6.061[a]	.000	81.50	Significant
	Left Eye	1.14	0.18	0.52	-6.258[a]	.000	84.20	Significant

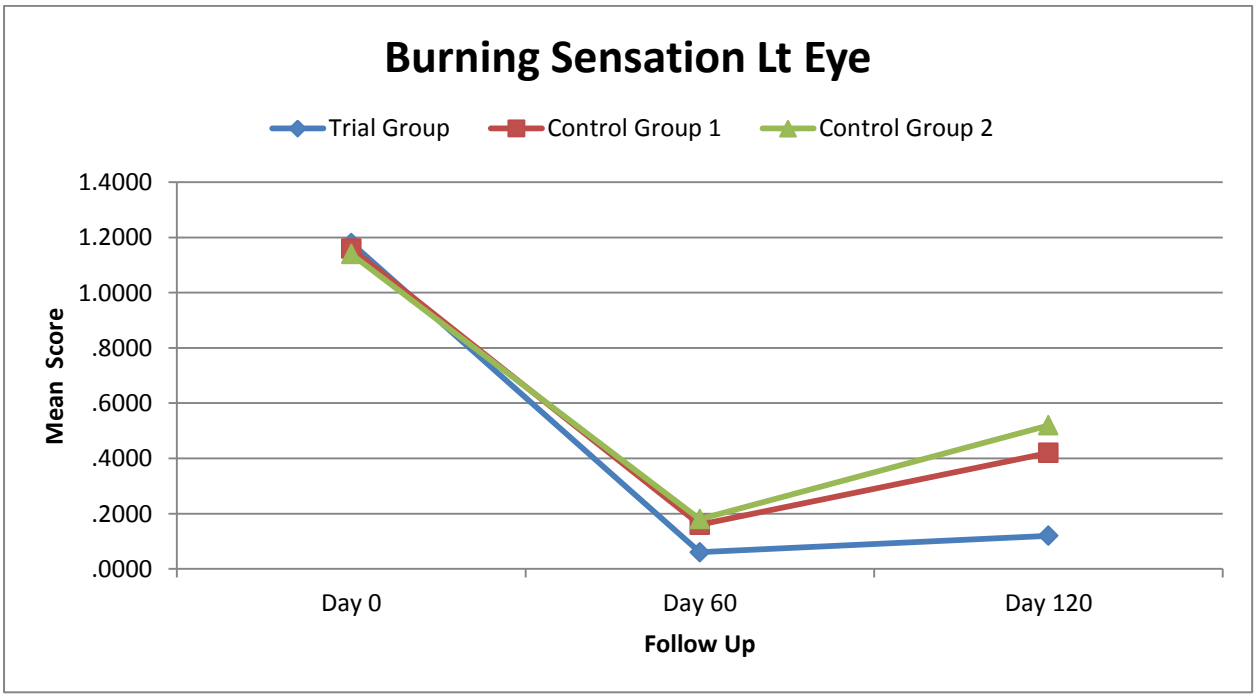
In trial group, mean score is decreased from 1.28 to 0.06 after treatment i.e. 95.30% effect is observed in right eye and mean score is decreased from 1.18 to 0.06 after treatment i.e. 94.90 % effect is observed in left eye , also P-Value is less than 0.05 the effect is significant on Burning Sensation. Furthermore recurrence is not significantly observed at day 120 in both eyes.

In control group 1, mean score is decreased from 1.38 to 0.22 after treatment i.e. 84.10% effect is observed in right eye and mean score is decreased from 1.16 to 0.16 after treatment i.e. 86.20 % effect is observed in left eye , also P-Value is less than 0.05 the effect is significant on Burning Sensation. Furthermore recurrence is significantly observed at day 120 in both eyes

In control group 2, mean score is decreased from 1.3 to 0.24 after treatment i.e. 81.50% effect is observed in right eye and mean score is decreased from 1.14 to 0.18 after treatment i.e. 84.20 % effect is observed in left eye , also P-Value is less than 0.05 the effect is significant on Burning Sensation. Furthermore recurrence is significantly observed at day 120 in both eyes

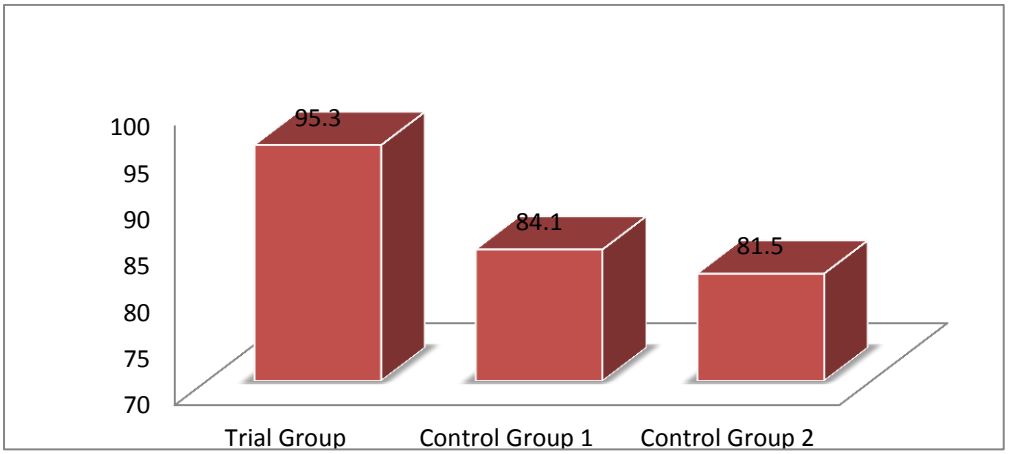
Graph 12 – Effect on Burning Sensation in eyes according to Mean





Graph 13-Percentagewise effect on Burning sensation in eyes in 3 groups

RIGHT EYE



LEFT EYE

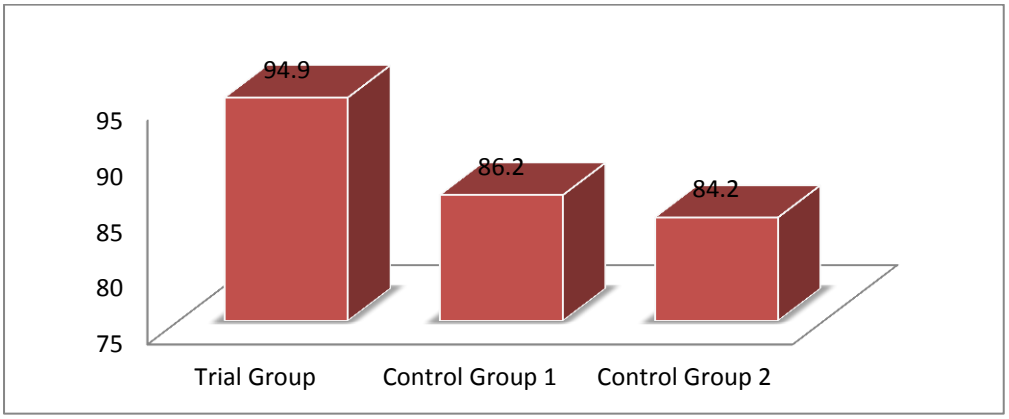


Table 21-Classification of patients according to Burning Sensation in eyes

Trial Group (Goghṛuta Aścotana)

Burning Sensation Gradation	0th day		60th day		120th day	
	Rt	Lt	Rt	Lt	Rt	Lt
0	1	1	47	47	44	44
1	34	39	3	3	6	6
2	15	10	0	0	0	0
3	0	0	0	0	0	0

Control Group 1 (Moisol Eye Drop)

Burning Sensation Gradation	0th day		60th day		120th day	
	Rt	Lt	Rt	Lt	Rt	Lt
0	2	2	33	33	25	28
1	26	38	17	17	25	22
2	22	10	0	0	0	0
3	0	0	0	0	0	0

Control Group 2 (ARC glasses)

Burning Sensation Gradation	0th day		60th day		120th day	
	Rt	Lt	Rt	Lt	Rt	Lt
0	0	0	38	41	26	24
1	35	43	12	9	24	26
2	15	7	0	0	0	0
3	0	0	0	0	0	0

Rt Eye

In Trial group, 1 patient has no burning sensation, 34 patients have mild and 15 patients have moderate degree of burning sensation on 0^{th} day. On 60^{th} day, 47 patients have no burning sensation and 3 patients have moderate burning sensation. While on 120^{th} day, 44 patients have no burning sensation & 6 patients have mild burning sensation.

In Control Group 1, on 0^{th} day, 2 patients have no burning sensation in eyes, 26 patients have mild & 22 patients have moderate degree of burning in eyes. On 60^{th} day, 33 patients are symptomless and 17 patients have mild degree of burning sensation in eyes. On 120^{th} day, 25 patients have no burning sensation in eyes & 25 patients have mild degree of burning sensation in eyes.

In Control group 2, 35 patients have mild and 15 patients have moderate degree of burning sensation on 0^{th} day. On 60^{th} day, 38 patients have no burning sensation and 12 patients have moderate burning sensation. While on 120^{th} day, 26 patients have no burning sensation & 24 patients have mild burning sensation.

Lt Eye

In Trial group, 1 patient has no burning sensation, 39 patients have mild and 10 patients have moderate degree of burning sensation on 0^{th} day. On 60^{th} day, 47 patients have no burning sensation and 3 patients have moderate burning sensation. While on 120^{th} day, 44 patients have no burning sensation & 6 patients have mild burning sensation.

In Control Group 1, on 0^{th} day, 2 patients have no burning sensation in eyes, 38 patients have mild & 10 patients have moderate degree of burning in eyes. On 60^{th} day, 33 patients are symptomless and 17 patients have mild degree of burning sensation in eyes. On 120^{th} day, 28 patients have no burning sensation in eyes & 22 patients have mild degree of burning sensation in eyes.

In Control group 2, 43 patients have mild and 7 patients have moderate degree of burning sensation on 0^{th} day. On 60^{th} day, 41 patients have no burning sensation and 9 patients have mild burning sensation. While on 120^{th} day, 24 patients have no burning sensation & 26 patients have mild burning sensation.

Interpretation

All 3 groups have significant effect observed. But Goghṛuta Aścotana is more significant than Moisol eye drop & ARC glasses. Moisol eye drop is more significant than ARC glasses. Recurrence is not significantly observed in Trial Group but significantly observed in Control Group 1 & Control Group 2 on 120^{th} day.

ITCHING IN EYES

Table 22 - Effect on Itching in eyes in 3 groups

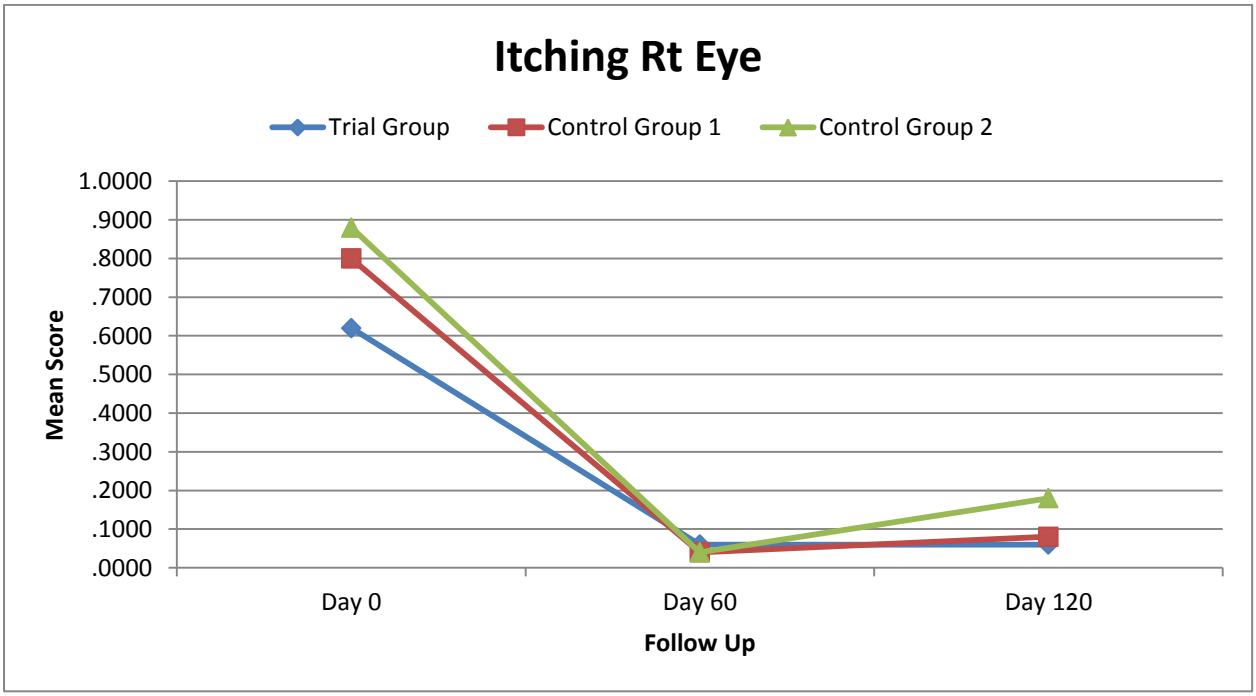
Itching		Mean			Wilcoxon Signed Rank W	P-Value	% Effect	Result
		Day 0	Day 60	Day 120				
Trial Group	Right Eye	.6200	.0600	.0600	-4.939[a]	.000	90.30	Significant
	Left Eye	.6200	.0600	.0600	-5.112[a]	.000	90.30	Significant
Control Group 1	Right Eye	.8000	.0400	.0800	-5.856[a]	.000	95.00	Significant
	Left Eye	.7400	.0400	.0600	-5.916[a]	.000	94.60	Significant
Control Group 2	Right Eye	0.88	0.04	0.18	-6.332[a]	.000	95.50	Significant
	Left Eye	0.86	0.02	0.18	-6.481[a]	.000	97.70	Significant

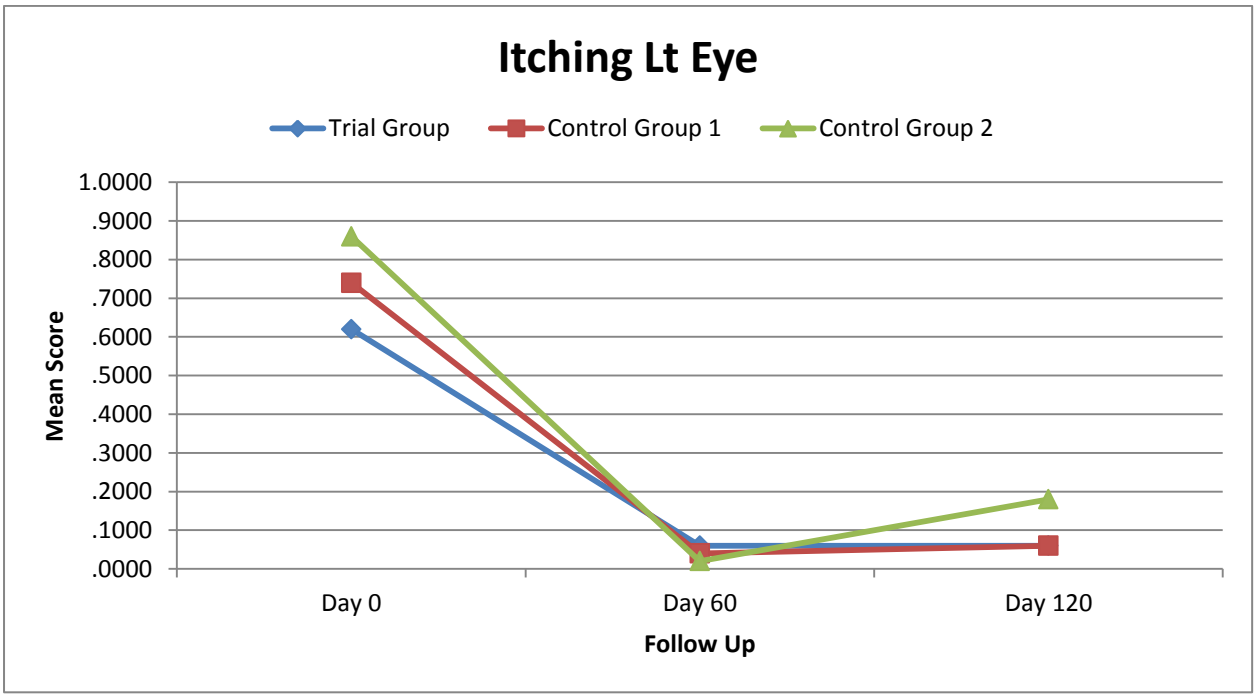
In trial group, mean score is decreased from 0.62 to 0.06 after treatment i.e. 90.30% effect is observed in right eye and mean score is decreased from 0.62 to 0.06 after treatment i.e. 90.30 % effect is observed in left eye, also P-Value is less than 0.05 the effect is significant on Itching. Furthermore recurrence is not significantly observed at day 120 in both eyes.

In control group 1, mean score is decreased from 0.80 to 0.04 after treatment i.e. 95% effect is observed in right eye and mean score is decreased from 0.74 to 0.04 after treatment i.e. 94.60 % effect is observed in left eye , also P-Value is less than 0.05 the effect is significant on Itching. Furthermore recurrence is significantly observed at day 120 in both eyes

In control group 2, mean score is decreased from 0.88 to 0.04 after treatment i.e. 95.50% effect is observed in right eye and mean score is decreased from 0.86 to 0.02 after treatment i.e. 97.70 % effect is observed in left eye , also P-Value is less than 0.05 the effect is significant on Itching. Furthermore recurrence is significantly observed at day 120 in both eyes

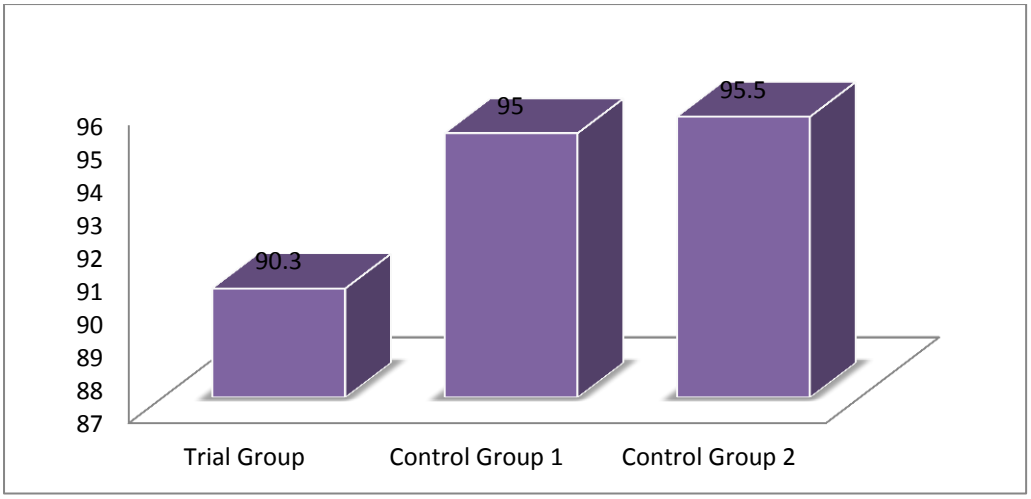
Graph 14 – Effect of Itching in eyes according to Mean





Graph 15-Percentwise effect on Itching in eyes in 3 groups

RIGHT EYE



LEFT EYE

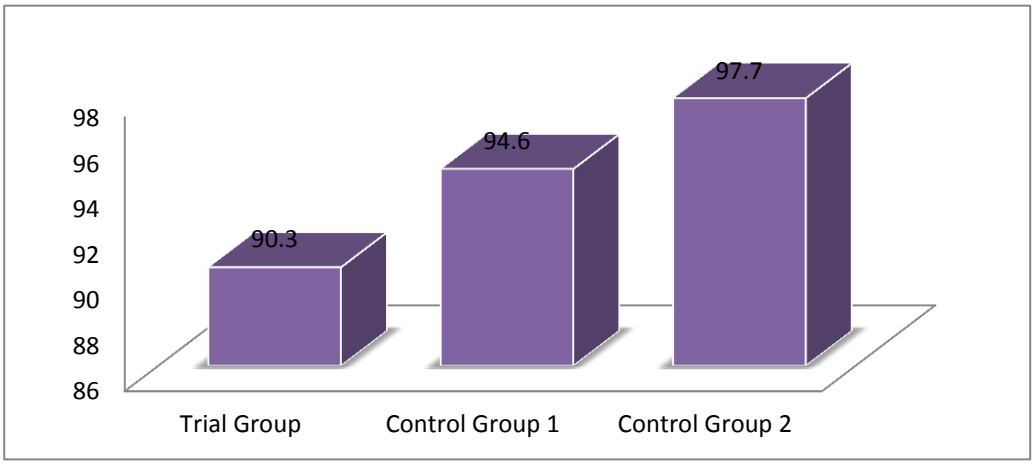


Table 23-Classification of patients according to Itching in eyes

Trial Group (Goghṛuta Aścotana)

Itching in eyes	0th day		60th day		120th day	
Gradation	Rt	Lt	Rt	Lt	Rt	Lt
0	21	20	47	47	47	47
1	27	29	3	3	3	3
2	2	1	0	0	0	0
3	0	0	0	0	0	0

Control Group 1 (Moisol Eye Drop)

Itching in eyes	0th day		60th day		120th day	
Gradation	Rt	Lt	Rt	Lt	Rt	Lt
0	13	13	48	48	46	47
1	34	37	2	2	4	3
2	3	0	0	0	0	0
3	0	0	0	0	0	0

Control Group 2 (ARC glasses)

Itching in eyes	0th day		60th day		120th day	
Gradation	Rt	Lt	Rt	Lt	Rt	Lt
0	7	7	48	49	41	41
1	42	43	2	1	9	9
2	1	0	0	0	0	0
3	0	0	0	0	0	0

Rt Eye

In trial group, 21 patients have no itching in eyes, 27 patients have mild and 2 patients have moderate degree of itching in eyes on 0^{th} day. On 60^{th} day, 47 patients have no itching in eyes and 3 patients have mild itching in eyes. While on 120^{th} day, 47 patients were symptomless & 3 patients have mild itching in eyes.

In Control Group 1, on 0^{th} day, 13 patients have no itching in eyes, 34 patients have mild & 3 patients have moderate degree of itching in eyes**.** On 60^{th} day, 48 patients were symptomless and 2 patients have mild degree of itching in eyes. On 120^{th} day, 46 patients have no itching in eyes in eyes & 4 patients have mild degree of itching in eyes.

In Control group 2, 7 patients have no itching in eyes, 42 patients have mild and 1 patient has moderate degree of itching in eyes on 0^{th} day. On 60^{th} day, 48 patients have no itching in eyes and 2 patients have mild itching in eyes. While on 120^{th} day, 41 patients have no itching in eyes & 9 patients have mild itching in eyes.

Lt Eye

In trial group, 20 patients have no burning itching in eyes, 29 patients have mild and 1 patient has moderate degree of itching in eyes on 0^{th} day. On 60^{th} day, 47 patients have no itching in eyes and 3 patients have mild itching in eyes. While on 120^{th} day, 47 patients were symptomless & 3 patients have mild itching in eyes.

In Control Group 1, on 0^{th} day, 13 patients have no itching in eyes, 37 patients have mild degree of itching in eyes**.** On 60^{th} day, 48 patients were symptomless and 2 patients have mild degree of itching in eyes. On 120^{th} day, 47 patients have no itching in eyes in eyes & 3 patients have mild degree of itching in eyes.

In Control group 2, 7 patients have no itching in eyes, 43 patients have mild degree of itching in eyes on 0^{th} day. On 60^{th} day, 49 patients have no itching in eyes and 1 patient has mild itching in eyes. While on 120^{th} day, 41 patients have no itching in eyes & 9 patients have mild itching in eyes

Interpretation

All 3 groups have significant effect observed. ARC glasses and Moisol eye drop have more significant effect than Goghṛuta Aścotana. Recurrence is not significantly observed in Trial Group but significantly observed in Control Group 1 & Control Group 2 on 120^{th} day.

TEAR FILM BREAK UP TIME

Table 24 - Effect on Tear Film Break Up Time in 3 groups

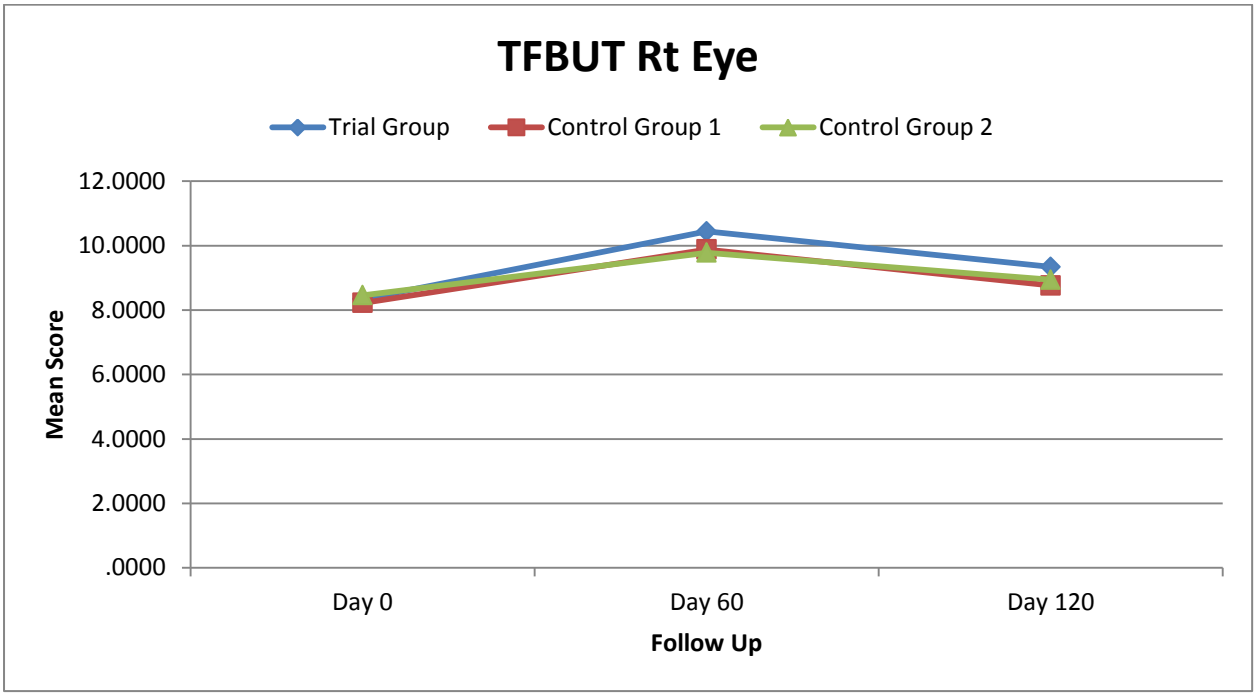
TFBUT		Mean			Wilcoxon Signed Rank W	P-Value	% Increament	Result
		Day 0	Day 60	Day 120				
Trial Group	Right Eye	8.3400	10.4400	9.3400	-6.135[b]	.000	25.20	Significant
	Left Eye	8.4000	10.3400	9.2400	-5.727[b]	.000	23.10	Significant
Control Group 1	Right Eye	8.2200	9.8800	8.7600	-5.755[b]	.000	20.20	Significant
	Left Eye	8.3000	9.8200	8.8400	-5.712[b]	.000	18.30	Significant
Control Group 2	Right Eye	8.46	9.78	8.94	-6.191[b]	.000	15.60	Significant
	Left Eye	8.62	9.76	9.04	-5.684[b]	.000	13.20	Significant

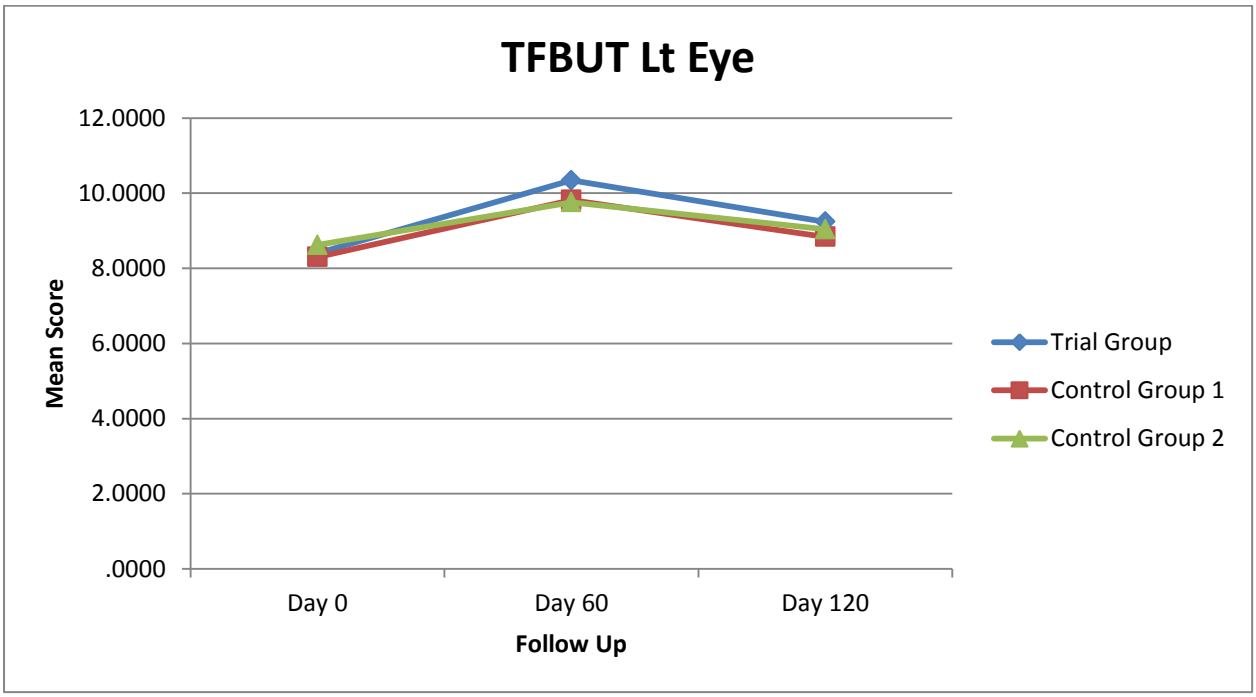
In trial group, mean score is increased from 8.34 to 10.44 after treatment i.e. 25.20% increment is observed in right eye and mean score is increased from 8.4 to 10.34 after treatment i.e. 23.10 % increment is observed in left eye, also P-Value is less than 0.05 the effect is significant on TFBUT. Furthermore recurrence is not significantly observed at day 120 in both eyes.

In control group 1, mean score is increased from 8.22 to 9.88 after treatment i.e. 20.20% increment is observed in right eye and mean score is increased from 8.3 to 9.82 after treatment i.e. 18.30 % increment is observed in left eye, also P-Value is less than 0.05 the effect is significant on TFBUT. Furthermore recurrence is significantly observed at day 120 in both eyes

In control group 2, mean score is increased from 8.46 to 9.78 after treatment i.e. 15.60 % increment is observed in right eye and mean score is decreased from 8.62 to 9.76 after treatment i.e. 13.20 % increment is observed in left eye, also P-Value is less than 0.05 the effect is significant on TFBUT. Furthermore recurrence is significantly observed at day 120 in both eyes.

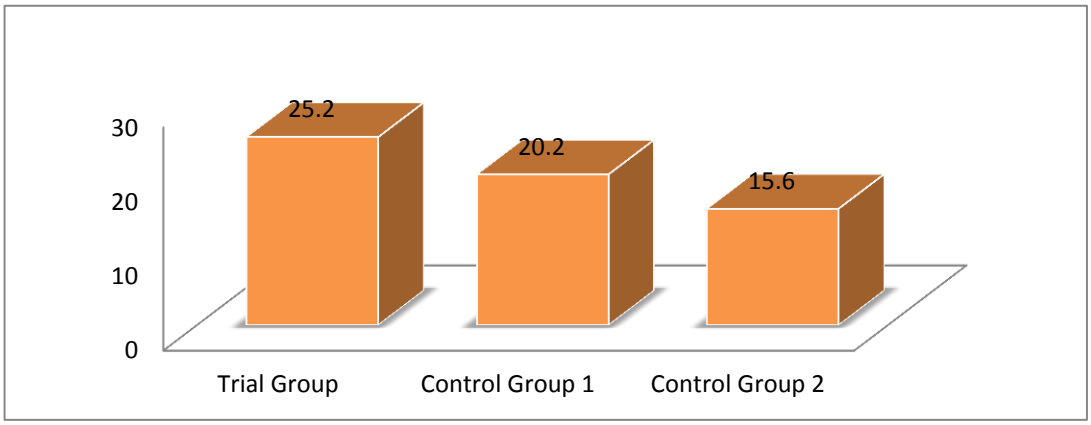
Graph 16 – Effect of TFBUT according to Mean





Graph 17 - Percentwise effect on TFBUT in eyes in 3 groups

RIGHT EYE



LEFT EYE

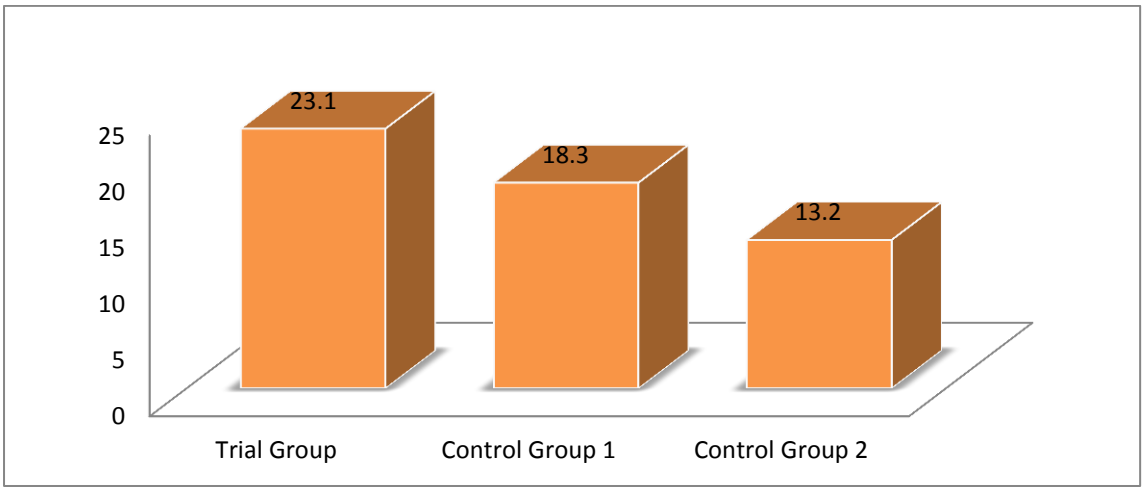


Table 25 - Classification of patients according to Tear Film Break up Time (in secs)

Trial Group (Goghṛuta Aścotana)

TFBUT Gradation	0th day		60th day		120th day	
	Rt	Lt	Rt	Lt	Rt	Lt
<8	8	7	0	2	0	1
8-10	42	43	46	44	46	45
>10	0	0	4	4	4	4

Control Group 1 (Moisol Eye Drop)

TFBUT Gradation	0th day		60th day		120th day	
	Rt	Lt	Rt	Lt	Rt	Lt
<8	9	7	0	0	0	0
8-10	41	43	48	48	49	49
>10	0	0	2	2	1	1

Control Group 2 (ARC glasses)

TFBUT Gradation	0th day		60th day		120th day	
	Rt	Lt	Rt	Lt	Rt	Lt
<8	7	5	0	0	2	1
8-10	43	44	42	40	48	47
>10	0	1	8	10	0	2

Rt Eye

In trial group, 8 patients have TFBUT less than 8 secs, 42 patients have TFBUT between 8 –10secs on 0^{th} day. On 60^{th} day, 46 patients have TFBUT between 8 –10secs and 4 patients have TFBUT more than 10 secs. While on 120^{th} day, 46 patients have TFBUT between 8 –10secs and 4 patients have TFBUT more than 10 secs.

In Control Group 1, 9 patients have TFBUT less than 8 secs, 41 patients have TFBUT between 8 –10secs on 0^{th} day. On 60^{th} day, 48 patients have TFBUT between 8 –10secs and 2 patients have TFBUT more than 10 secs. While on 120^{th} day, 49 patients have TFBUT between 8 –10secs and 1 patient has TFBUT more than 10 secs.

In Control Group 2, 7 patients have TFBUT less than 8 secs, 43 patients have TFBUT between 8 –10secs on 0^{th} day. On 60^{th} day, 42 patients have TFBUT between 8 –10secs and 8 patients have TFBUT more than 10 secs. While on 120^{th} day, 2 patients have TFBUT less than 8 secs and 48 patients have TFBUT between 8 –10secs.

Lt Eye

In trial group, 7 patients have TFBUT less than 8 secs, 43 patients have TFBUT between 8 –10secs on 0^{th} day. On 60^{th} day, 2 patients have TFBUT less than 8 secs, 44 patients have TFBUT between 8 –10secs and 4 patients have TFBUT more than 10 secs. While on 120^{th} day, 1 patient has TFBUT less than 8 secs, 45 patients have TFBUT between 8 –10secs and 4 Patients have TFBUT more than 10 secs.

In Control Group 1, 7 patients have TFBUT less than 8 secs, 43 patients have TFBUT between 8 –10secs on 0^{th} day. On 60^{th} day, 48 patients have TFBUT between 8 –10secs and 2 patients have TFBUT more than 10 secs. While on 120^{th} day, 49 patients have TFBUT between 8 –10secs and 1 patient has TFBUT more than 10 secs.

In Control Group 2, 5 patients have TFBUT less than 8 secs, 44 patients have TFBUT between 8 –10secs & 1 patient has TFBUT more than 10 secs on 0^{th} day. On 60^{th} day, 40 patients have TFBUT between 8 –10secs and 10 patients have TFBUT more than 10 secs. While on 120^{th} day, 1 patient has TFBUT less than 8 secs and 47 patients have TFBUT between 8 –10secs and 2 patients have TFBUT more than 10 secs.

Interpretation

All 3 groups have significant effect observed. But Goghṛuta Aścotana is more significant than Moisol eye drop & ARC glasses. Moisol eye drop is more significant than ARC glasses. Recurrence is not significantly observed in Trial Group but significantly observed in Control Group 1 & Control Group 2 on 120^{th} day.

SCHIRMER'S TEST I

Table 26 - Effect on Schirmer Test I in 3 groups

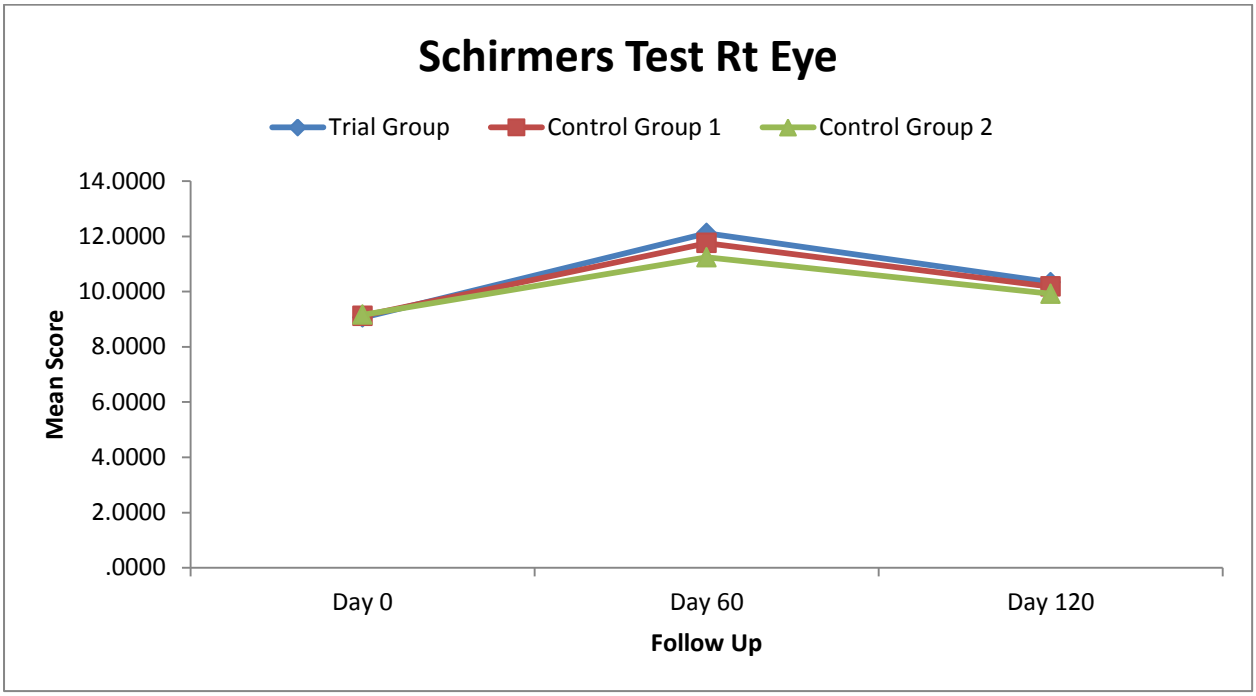
Schrimer test		Mean			Wilcoxon Signed Rank W	P-Value	% Increament	Result
		Day 0	Day 60	Day 120				
Trial Group	Right Eye	9.0600	12.1200	10.3400	-5.383[b]	.000	33.80	Significant
	Left Eye	9.0400	12.1000	10.3200	-5.980[b]	.000	33.80	Significant
Control Group 1	Right Eye	9.1200	11.7600	10.1800	-5.623[b]	.000	28.90	Significant
	Left Eye	9.3200	11.8800	10.2200	-5.489[b]	.000	27.50	Significant
Control Group 2	Right Eye	9.16	11.24	9.92	-6.207[b]	.000	22.70	Significant
	Left Eye	9.36	11.4	10.1	-6.051[b]	.000	21.80	Significant

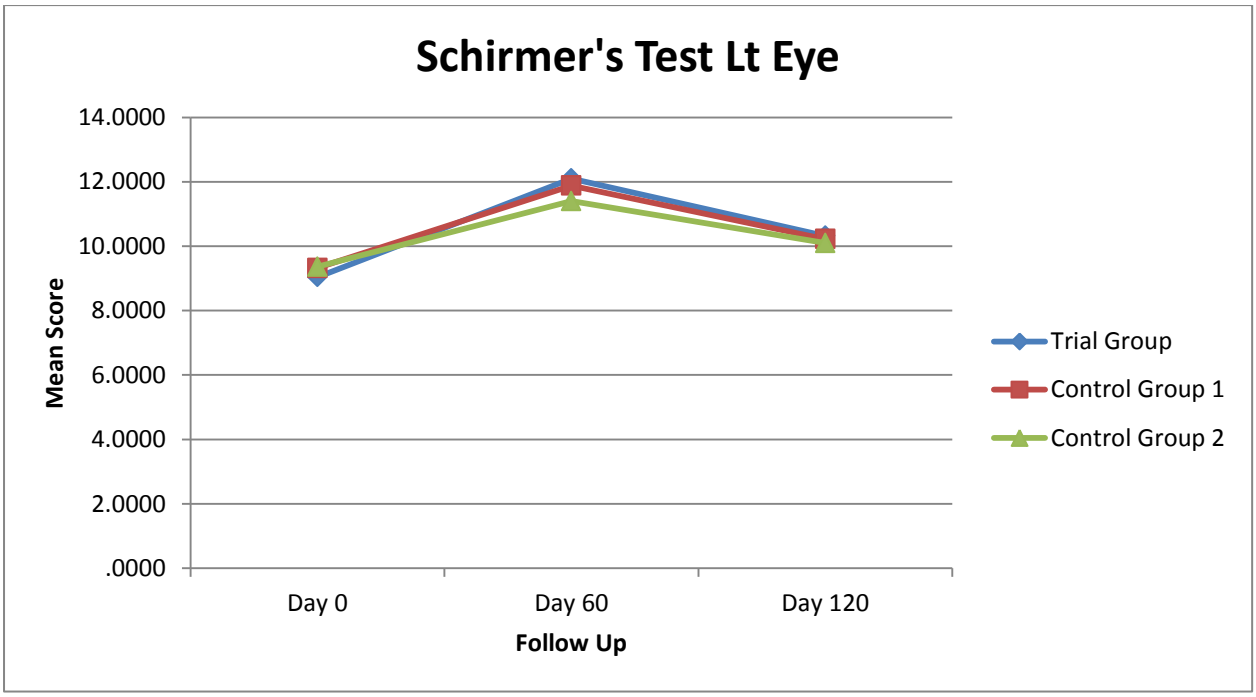
In trial group, mean score is increased from 9.06 to 12.12 after treatment i.e. 33.80% increment is observed in right eye and mean score is increased from 9.04 to 12.10 after treatment i.e. 33.80 % increment is observed in left eye , also P-Value is less than 0.05 the effect is significant on Schirmer Test. Furthermore recurrence is significantly observed at day 120 in both eyes.

In control group 1, mean score is increased from 9.12 to 11.76 after treatment i.e. 28.90% increment is observed in right eye and mean score is increased from 9.32 to 11.88 after treatment i.e. 27.50 % increment is observed in left eye , also P-Value is less than 0.05 the effect is significant on Schirmer Test. Furthermore recurrence is significantly observed at day 120 in both eyes

In control group 2, mean score is increased from 9.16 to 11.24 after treatment i.e. 22.70 % increment is observed in right eye and mean score is decreased from 9.36 to 11.4 after treatment i.e. 21.80 % increment is observed in left eye , also P-Value is less than 0.05 the effect is significant on Schirmer Test. Furthermore recurrence is significantly observed at day 120 in both eye.

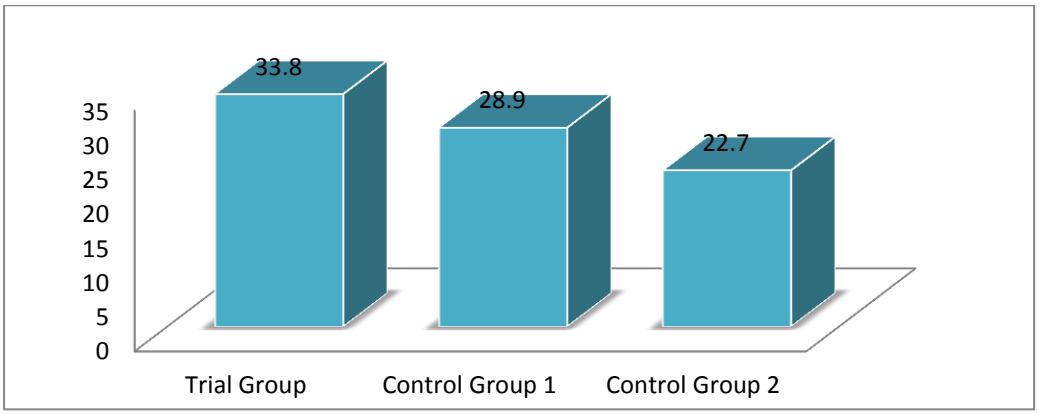
Graph 18 – Effect of Schirmer Test 1 according to Mean





Graph 19- Percentwise effect on Schirmer Test I in eyes in 3 groups

RIGHT EYE



LEFT EYE

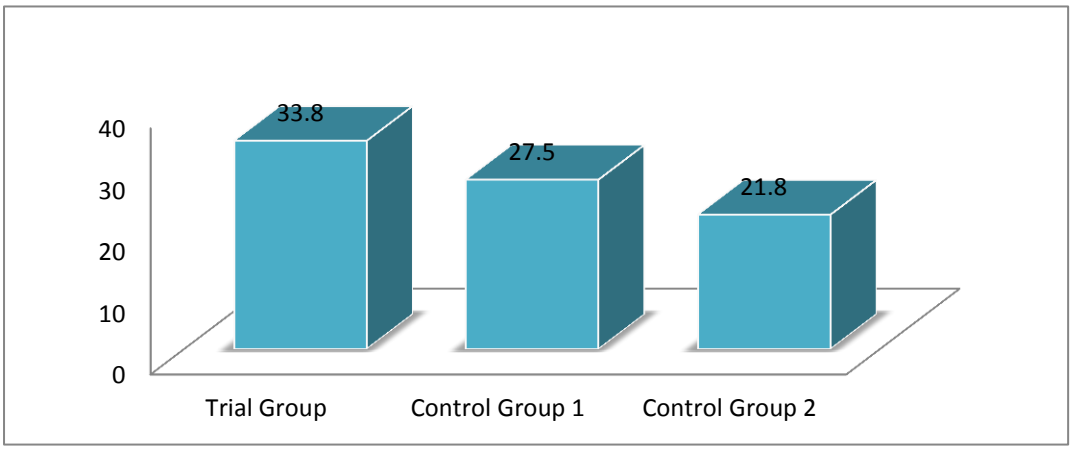


Table 27-Classification of patients according to Schirmer test 1 (in mm)

Trial Group (Goghṛuta Aścotana)

TFBUT Gradation	0^{th} day		60^{th} day		120^{th} day	
	Rt	Lt	Rt	Lt	Rt	Lt
<8	2	2	0	2	0	1
8-10	46	46	37	36	34	35
>10	2	2	13	14	16	15

Control Group 1 (Moisol Eye Drop)

TFBUT Gradation	0^{th} day		60^{th} day		120^{th} day	
	Rt	Lt	Rt	Lt	Rt	Lt
<8	1	1	0	0	0	0
8-10	49	47	29	24	39	39
>10	0	2	21	26	11	11

Control Group 2 (ARC Glasses)

TFBUT Gradation	0^{th} day		60^{th} day		120^{th} day	
	Rt	Lt	Rt	Lt	Rt	Lt
<8	1	0	0	0	0	0
8-10	46	43	16	14	37	31
>10	3	7	34	36	13	19

Rt Eye

In trial group, 2 patients have Schirmer Test 1 less than 8 mm, 46 patients have Schirmer Test 1 between 8 -10mm & 2 patients have Schirmer Test 1 more than 10mm on 0^{th} day. On 60^{th} day, 37 patients have Schirmer Test 1 between 8 –10mm and 13 patients have Schirmer Test 1 more than 10 mm. While on 120^{th} day, 34 patients have Schirmer Test 1 between 8 –10mm and 16 patients have Schirmer Test 1 more than 10 mm.

In Control Group 1, 1 patient has Schirmer Test 1 less than 8 mm, 49 patients have Schirmer Test 1 between 8 -10mm on 0^{th} day. On 60^{th} day, 29 patients have Schirmer Test 1 between 8 –10mm and 21 patients have Schirmer Test 1 more than 10 mm. While on 120^{th} day, 39 patients have Schirmer Test 1 between 8 –10mm and 11patients have Schirmer Test 1 more than 10 mm.

In Control Group 2, 1 patient has Schirmer Test 1 less than 8 mm, 46 patients have Schirmer Test 1 between 8 -10mm & 3 patients have Schirmer test more than 10mm on 0^{th} day. On 60^{th} day, 16 patients have Schirmer Test 1 between 8 –10mm and 34 patients have Schirmer Test 1 more than 10 mm. While on 120^{th} day, 37 patients have Schirmer Test 1 between 8 –10mm and 13 patients have Schirmer Test 1 more than 10 mm.

Lt Eye

In trial group, 2 patients have Schirmer Test 1 less than 8 mm, 46 patients have Schirmer Test 1 between 8 -10mm & 2 patients have Schirmer Test 1 more than 10mm on 0^{th} day. On 60^{th} day, 36 patients have Schirmer Test 1 between 8 –10mm and 14 patients have Schirmer Test 1 more than 10 mm. While on 120^{th} day, 35 patients have Schirmer Test 1 between 8 –10mm and 15 patients have Schirmer Test 1 more than 10 mm.

In Control Group 1, 1 patient has Schirmer Test 1 less than 8 mm, 47 patients have Schirmer Test 1 between 8 -10mm & 2 patients have Schirmer test 1 more than 10mm on0^{th} day. On 60^{th} day, 24 patients have Schirmer Test 1 between 8 –10mm and 26 patients have Schirmer Test 1 more than 10 mm. While on 120^{th} day, 39 patients have Schirmer Test 1 between 8 –10mm and 11patients have Schirmer Test 1 more than 10 mm.

In Control Group 2 , 43 patients have Schirmer Test 1 between 8 -10mm & 7 patients have Schirmer test more than 10mm on 0^{th} day. On 60^{th} day, 14 patients have

Schirmer Test 1 between 8 –10mm and 36 patients have Schirmer Test 1 more than 10 mm. While on 120th day, 31 patients have Schirmer Test 1 between 8 –10mm and 19 patients have Schirmer Test 1 more than 10 mm.

Interpretation

All 3 groups have significant effect observed. But Goghṛuta Aścotana is more significant than Moisol eye drop & ARC glasses. Moisol eye drop is more significant than ARC glasses. Recurrence is significantly observed in all Three Groups on 120th day.

DISCUSSION

- **Discussion**
- **Further Scope Of Study**

DISCUSSION

With the advent of computer, users confront with new challenges both at their work place and school systems. By working for long hours, using a computer monitor, a complication of vision and ophthalmic symptoms may develop. They are collectively known as Computer Vision Syndrome (CVS).

According to National Institute Occupational Safety and Health, computer vision syndrome affects some 90% of the people who spend three or more hours a day on a computer. Previous studies have estimated that the prevalence of CVS ranges between 64 and 90% among computer users. It has been estimated that nearly 60 million people suffer from CVS globally and about one million new cases occur each year.

In study it was observed that

Age:

The incidence of Computer Vision Syndrome was observed higher in the age group of 26 to 45 years and minimum below the age of 25 years. It is probably because more exposure to computer and air conditioning in this age group.

Sex:

The incidence of Shushkaashipak (Dry eye syndrome) was observed higher in males than females in Trial Group and Control Group 2 but in Control Group 1 incidence of females are more than males.

Occupation:

A higher prevalence seen in service sector and students probably because of more exposure to computer, more working hours in front of computers.

In this study it was Statistically analysed analysed that

Goghṛuta Aścotana, Moisol eye drop & Antireflection coating glasses have significant effect in all the parameters in CVS. But As compared to two control groups, Goghṛuta Aścotana has more significant effect in Hedache, Dryness in eyes, Burning sensation in eyes, Eye fatigue, TFBUT & Schirmer test 1.In symptom Redness, there is no significant difference observed between 3 groups & In itching

ARC glasses and Moisol eye drop have more significant effect than Goghṛuta Aścotana.

It was also observed that in Trial Group On 120th day, there was no any significant recurrence seen in Hedache, Dryness in eyes, Burning sensation in eyes, Redness in eyes, Eye Fatigue, Itching in eyes and in Tear film Break Up Time. In Schirmer test I, recurrence was significantly observed.

In Control Group1 on 120th day, there was significant recurrence seen in Hedache, Dryness in eyes, Burning sensation in eyes, Redness in eyes, Eye, Itching in eyes, in Tear film Break Up Time and in Schirmer test I. In Eye fatigue, recurrence was not significantly observed.

In Control Group 2 on 120th day, there was significant recurrence seen in Hedache, Dryness in eyes, Burning sensation in eyes, Redness in eyes, Itching in eyes, Eye fatigue, in Tear film Break Up Time and in Schirmer test I.

Artificial tear drops and AR coating glasses are most commonly used contemporary line of treatment by ophthalmologists in CVS, But they have have their own limitations and so no satisfactory treatment is available for Computer Vision Syndrome. Computer Vision Syndrome is somewhat related to the Śauṣkaakṣaipaka in Āyurveda.

Symptoms of Śauṣkaakṣaipaka are Gharṣaṇa (gritting sensation), Toda (pricking pain), Bheda (pain), Upadeha(coating), Kṛucchomilana (difficulty in opening and closing of eye lid.), Viśuṣktva (dryness), Rūkṣa Darūṇa Vartma (dryness of eye lids).These symptoms can be correlated with symptoms of CVS in modern medicine .

In Āyurveda point of view, Atiyoga of Darśana (Excessive use of eye), Mithyāyoga of Darśana iaṃdriya (improper use of eyes), Sūkṣma, Nirikṣaṇāta (seeing very small objects), Ati samīpya (from very close distance) are the important causes responsible for CVS.

The symptoms of CVS are irritated eyes, eye strain, blurred vision, red eyes, burning eyes and headache. On critical analysis of the symptoms of CVS on Tridoṣik theory of Āyurveda, as per the road map given by Ācarya Caraka, it seems to be a Vāta pittajanya vyādhī.

Probable Mode of Action

As per Āyurvedic classics, It has properties as Snigdha, Gurū, oiliness, Mṛudu. It causes improvement in Tear film, increases TFBUT & reduction in dryness in eyes.

Goghṛuta is Cakṣuṣya & Rasayan. So it improves ocular strength & decreases Eye Fatigue.

Computer is a heat factory, so excessive use of computer increases pittadosha in netra and Goghṛuta has Pitta & Vatā pacifying properties. So it causes reduction in Burning sensation, Hedache & Redness.

According to pathophysiology of CVS, lipid layer of the tear film gets disturbed. Due to disturbed lipid layer, Tear Film Break up Time reduces remarkably. This disturbed tear film leads to dryness in the eye.

Lipophilic action of Goghṛuta, strengthens lipid layer of tear film. It increases Tear Film Break up Time and reduces Dryness.

It has lubricating properties which are very useful in reducing Dryness & Burning sensation in computer vision syndrome.

Cakṣuṣya property of Goghṛuta, Strengthens Ocular muscles. It results in development of pupillary reflex and good convergence mechanism. Because of this, patient get relief from Eye Fatigue & Headache.

Dry eye is a major symptom that is targeted in therapy of CVS. Because of lubricating property, the use of Moisol Eye Drop has significant effect in all parameters of CVS.

Antireflection coating improves both your vision through your lenses and the appearance of your eyeglasses. ARC coating eliminates the reflection of light from the front and back surface of eyeglasses lenses. Todays modern antireflective coatings can virtually eliminate the reflection of light from eye glasses lenses allowing 99.5%. So Because of antireflection coating & isolation of ocular surface, AR coating glasses have significant effect in all parameters of CVS.

Figure 21 -Probable Mode of Action of Goghṛuta According to Āyurveda

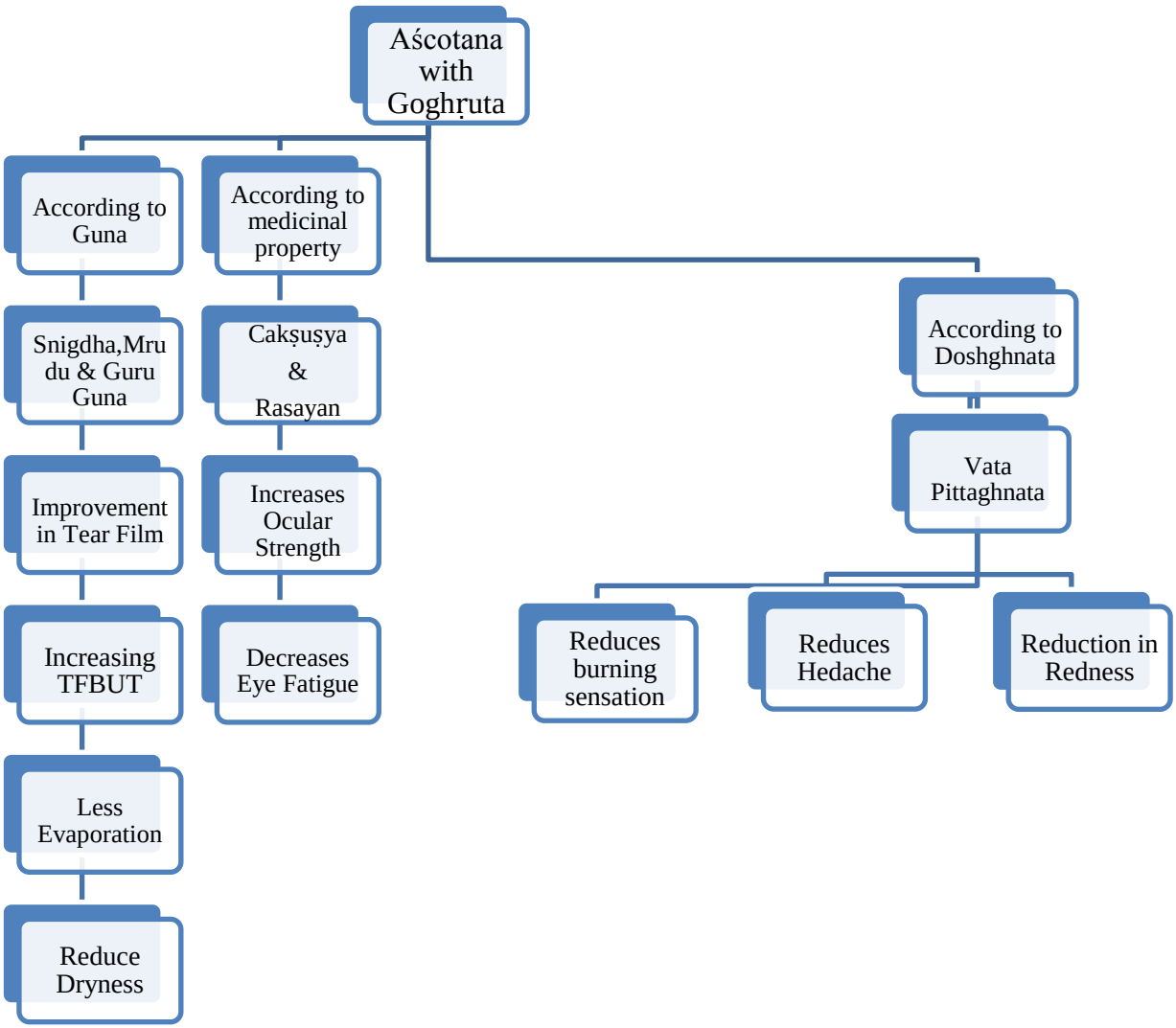
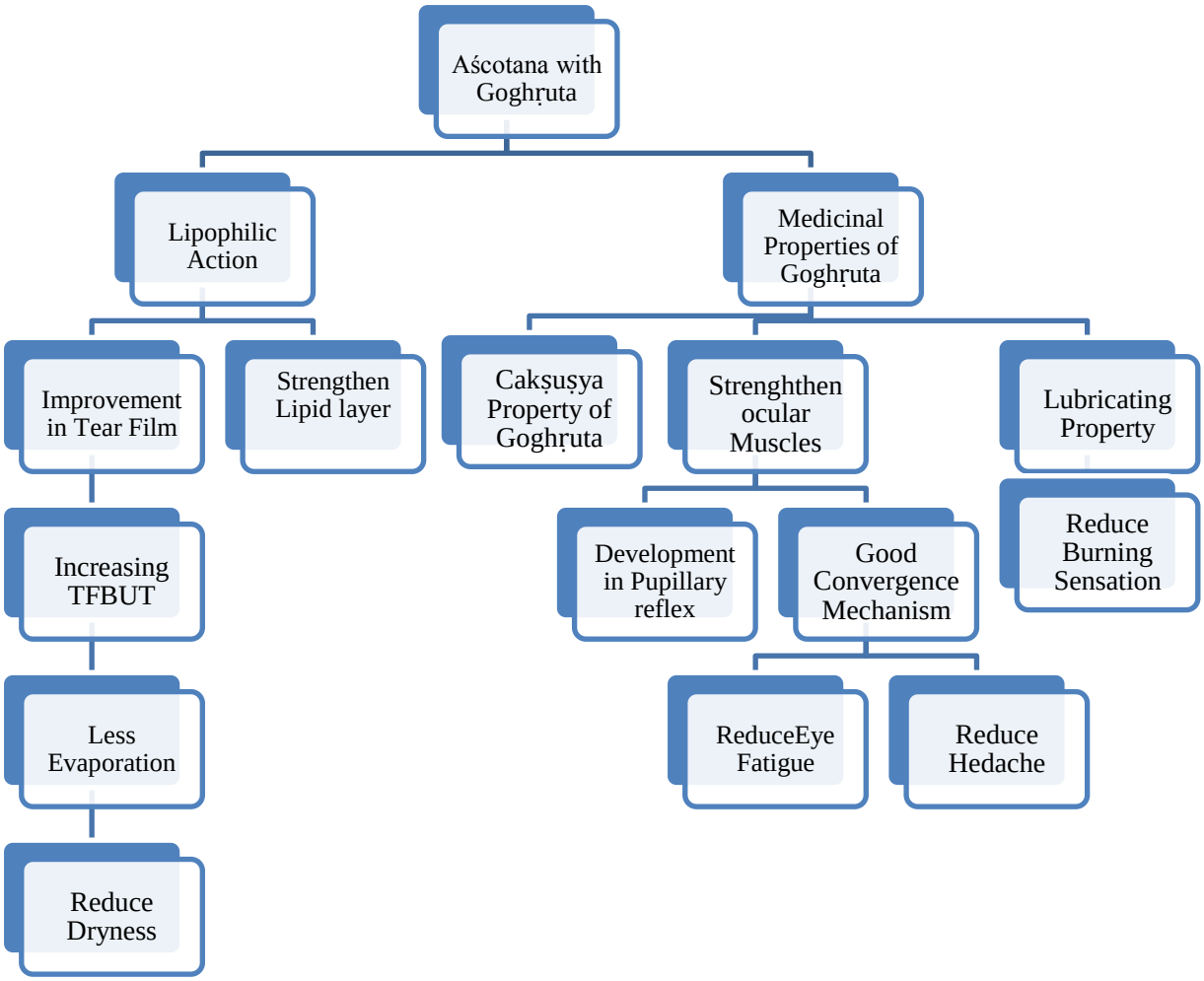


Figure 22-Probable Mode of Action of Goghṛuta According to Modern Science



FURTHER SCOPE OF STUDY

- Study can be done on CVS for longer duration of action.
- Study can be done on CVS with use of different Auśadhī siddha (medicated) Ghrutas.
- Study can be done on CVS by comparing medical line of treatment with computer ergonomics.
- Study can be done on CVS by using different Kriyākalpas other than Aścotana.
- Study can be done on Goghṛuta as the preventive measure in Computer Vision Syndrome.

CONCLUSION

Conclusion

- Computers are now an integral part of our day.
- Computer is a heat factory, so excessive use of computer increases pittadoṣa in netra and Goghṛuta has Pitta pacifying properties so it is useful in CVS.
- As per Āyurvedic classics, Goghṛuta has properties as Snigdha, Gurū, oiliness, Mṛṛudu & thus pacifying the Pitta and Vatā doṣa. Goghṛuta is Snehottama.
- As Goghṛuta is Snehottam, it reduces dryness in the eyes & increases TFBUT & Schirmer test 1.As it is Pitta Vaughan; it causes reduction in the headache, burning sensation & redness in the eyes.
- Goghṛuta is Cakṣuṣya & Rasayan. So it improves ocular strength & decreases Eye Fatigue.
- Lipophilic action of Goghṛuta, strengthens lipid layer of tear film. It increases Tear Film Break up Time and reduces Dryness. It has lubricating properties which are very useful in reducing dryness & burning sensation in computer vision syndrome.
- Cakṣuṣya property of Goghṛuta, strengthens ocular muscles. It results in development of pupillary reflex and good convergence mechanism. Because of this, patient gets relief from eye fatigue & headache.
- Because of these properties, Goghṛuta Aścotana has significant effect on all the parameters in CVS.
- Goghṛuta Aścotana, Moisol eye drop & Antireflection coating glasses have significant effect in all the parameters in CVS. But As compared to two control groups Goghṛuta Aścotana has more significant effect in Hedache, Dryness in eyes, Burning sensation in eyes, Eye fatigue, TFBUT & Schirmer test 1.In symptom Redness there is no significant difference observed between 3 groups & In itching ARC glasses and Moisol eye drop have more significant effect than Goghṛuta Aścotana.
- It was also analysed that in Trial Group On 120^{th} day, there was no any significant recurrence seen in all parameters except Schirmer Test I. In Control Group1 on 120^{th} day, there was significant recurrence seen in all the parameters except Eye

fatigue. In Control Group 2 on 120th day, there was significant recurrence seen in all the parameters.

- As Moisol eye drop contains preservative, its long term use is not indicated. But as Goghṛuta is self preservative, it can be used for longer duration.
- In this study it was also observed Moisol eye drop has shorter duration of action than Goghṛuta Aścotana.

SUMMARY

SUMMARY

Computers are now an integral part of our day. The advancement in computer science has brought about a vast change in our lives that we can't think computer less life. Inspite of benefits, user confronts new problems at their work places. Because of working long hours in front of computer, vision and ophthalmic symptoms may develop. These have been collectively called as Computer Vision Syndrome (CVS).

The American Optometric Association defines CVS as that "Complex of eye and vision problems related to near work that are experienced during or related to computer use.

Artificial eye drops and Anti reflection coating glasses are contemporary line of treatment in CVS. But they have their own limitations. According to Āyurved, Goghṛuta has the quality of Snigdha and oiliness. It is smooth, lubricating and nurturing. So in this study I have tried use of Goghṛuta Aścotana in Computer Vision Syndrome

Aim of this study was to study the efficacy of Goghṛuta Aścotana in Computer Vision Syndrome.

Goghṛuta was prepared from Indian cow milk as per standard method.

After preparation of Goghṛuta, Authentification was done at Pune university & Standardisation was done at Principal B.V. Bhide lab, Pune.

Total 150 patients having signs and symptoms of CVS were selected. Patients were randomly divided into three groups with 50 patients in each group.

In Trial group, Goghṛuta Aścotana was done in 50 patients.

There are 2 control groups in this study containing 50 patients in each group.

In 1st control group, Moisol eye drop was instilled 4 drops evening in 50 Patients.

In 2nd control group, Anti Reflection Coating glasses were given other than sleeping time in 50 patients.

For the assessment subjective as well as objective criteria was taken.

For subjective parameters

- Headache
- Dryness in eyes
- Burning Sensation in eyes
- Redness in eyes
- Eye Fatigue
- Itching in eyes

Gradation done as follows:

Normal 0 , Mild +, Moderate ++, Severe +++

For objective parameters TFBUT and Schirmer's test 1st were done.

Treatment was given for 60 days and after holding the treatment follow up was taken for 2 months. Follow up was taken on 0^{t} , 15th, 30th, 45th, 60th , 90th, 120th day.

In this study it was analysed that Goghṛuta Aścotana, Moisol eye drop & Antireflection coating glasses have significant effect in all the parameters in CVS. But As compared to two control groups, Goghṛuta Aścotana has more significant effect in Headache, Dryness in eyes, Burning sensation in eyes, Eye fatigue, TFBUT& Schirmer test 1. In symptom Redness there is no significant difference observed between 3 groups & in Itching ARC glasses and Moisol eye drop have more significant effect than Goghṛuta Aścotana.

It was also analysed that on 120th day in Trial Group, there was no any significant recurrence seen in all parameters except Schirmer Test I. In Control Group1 on 120th day, there was significant recurrence seen in all the parameters except Eye fatigue. In Control Group 2 on 120th day, there was significant recurrence seen in all the parameters.

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  शलाकायन्त्रप्रणिधानार्थ च □ सु.सु. १ क्र१0

- सर्वेन्द्रियाणि येनास्मिन प्राणा येन च संश्रिता□

  तेन तस्योत्तमांगस्य रक्षास्ववहितो भवेत □ अ.सं.उ.२८ क्र१४६

- विज्ञात द्वयंङ्गुलबाहुल्य स्वाङ्गुष्ठोदर सम्मितम □

  द्वयंङ्गुल सर्वत□साार्ध्द भिषङ्नयन बुदबुदम □

  सुवृत्तं गोस्तनाकांर सर्वभूतगुणोभ्दवम् □ सु.उ. १ क्र१0

- पलं भूवोऽम्नितो रक्तं वातात कृष्णं सितं जलात् □

  आकाशादश्रुमार्गश्च जायन्ते नेत्रबुदबुदे □ सु.उ.१क्र११

- मण्डलानि च सन्धीश्च पटलानि च लोचने □

  यथा□मं विजानियात पञ्चषट षडेवच् □ सु.उ.१क्र१४

- मसुरदलमात्रान्तु पन्चभूत प्रसादजाम □

  ख्द्योताविस्फुलिङ्गाभामिध्दां तेजोभिरव्ययै□□

  आवृतां पटले नाक्ष्णोर्बाहयेन विवराकृतिम□□

  शीतसात्म्या नृणां दृष्टिमाहुर्नयनचिन्तक□□ सु.उ.७क्र३□

- यत कुणितं दारूणरूक्षवर्त्म विलोकने चाविलदर्शनं यत □

  सुदारूण यन प्रतिबोधने च शुष्काक्षिपाकोपहतं तदक्षि □ सु.उ.६ □६

- वातफ्तिोतरं घर्षतोदभेदोपदेहवत □

  रूक्षदारूणवर्त्माक्षि कृच्छोन्मीलनम □

  विकुणनविशुष्कत्वशीने च्छाशूलपाकवत उक्त□शुष्काक्षिपाकोऽयम □ अ.तं.उ.१८क्र१६

- उष्णाभितप्तस्य जलप्रवेशाद दुरेक्षणात स्वप्नविपर्ययाच्च □

  प्रसक्तसंरोदन कोपशोकक्लेश भिघातादनिमैथुनाच्च □

  शूक्तारनालाम्ल कुलत्थमाषनिषेवणाद वेगाविनिग्रहाच्च □

  स्वेदादयो धूमनिषेवणाच्च छर्देविघाताद वमनानियोगात □

  बाष्पग्रहात सूक्ष्मनिरीक्षणाच्च नेत्रेविकारान जनयन्ति दोषा□ सु.उ.१क्र२६□७

- सर्वेषामक्षिरोगाणामादावाश्चोतनं हितम □

  रक्तोदकण्डू घर्षाशुदाहरागविवर्हणम □□ वा.सू.२३क्र१

- यथादोषोपयुक्तंतु नातिप्रबलमोजसा □

  रोगमाश्च्योतनं हन्ति सेकस्तु बलक्तरम □□ सु.उ.१८□४

- निवातस्थस्य वामेन पाणिनोन्मील्य लोचनम □

  शुक्त्या प्रलंबयान्येन पिचुवर्त्या कनीनिके □

  दश द्वादश वा बिन्दून दव्यंगुलादवसेचयेत ||

  तत□प्रमृज्य मृदुना चैलेन कफवातयो□

  अन्येन कोष्णपानीयप्लुतेन स्वेदयेन्मृदु || वा.सू.२३□३□४.

- घृतं मधुरं सौम्यं.....

  चक्षुष्यग्र्य बल्यं च गव्य सर्पिगुणोत्त्तरम || सु.सू.४५क्र९७

- सर्पिगवंचमृतकं विषघ्नं चक्षुष्य आरोग्यमच वृषम |

  रसायनं मन्दतीवं मेध्यं स्नेहोत्त्तम चेतिबुध□स्तुवन्ति || यो.र.२

- घृतं शीतं रसे पाके मधुरं जीवनं मतम |

  ..... चक्षुष्यं कफकृत पोक्तमग्निदीप्तकरं गुरू || नि.र.

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ANNEXURE

ANNEXURE

CASE PAPER PROFORMA

BHARTI VIDYAPEETH DEEMED UNIVERSITY

AYURVED HOSPITAL

KATRAJ – DHANKAWDI, PUNE – 43.

THE EFFICACY OF GOGHRUTA ASCHYOTANA IN COMPUTER VISION SYNDROME.

NAME OF STUDENT – Dr. Santosh S. Mulik.

Date - / / 2010 O.P.D. No. - Case No.:-

Name of patient:- _____.

Age:- Sex – M / F

Educational Status – E / U Occupation –

Address -

_____.

PRESENT COMPLAINTS:-

OTHER COMPLAINTS:-

HISTORY:-

Present Illness:-

Past Illness:-

CLINICAL EXAMINATIONS		**Right**	**Left**
Lids (upper & lower)	–		
Conjunctiva	–		
Sclera	–		
Cornea	–		
Anterior chamber	–		
Iris	–		
Pupil	–		
Lens	–		
Sac	–		
Other	–		

VISION

Distant	–		
Near	–		
With P.H	–		
With glasses	–		

SYSTEMIC EXAMINATION

Temp - ^{o}f **Respiration -** /min **B.P** – / mm of Hg **Pulse -** / min.

OBSERVATION CHART

Sr. No.	Signs and symptoms	No. of Days for follow up					No. Of Days for Observations.	
		0	15th	30th	45th	60th	90th	120th
1	Headache							
2	Dryness in eyes							
3	Burning Sensation							
4	Redness							
5	Eye Fatigue							
6	Itching							

GRADATION CHART

Normal	0
Mild	+
Moderate	++
Severe	+++

TFBUT Test

Schirmer's test 1

DIAGNOSIS – Computer Vision Syndrome

TREATMENT - Goghruta eye drop / Moisol eye drop / Anti Reflection Coating Gasses

↓ ↓ ↓

Dose: 4 drops at evening 4 drops at evening Continuously other than sleeping time.

Signature of student **Signature of Guide**

Vd. Santosh S. Mulik **Dr. Dilip Bhusari**
M.D. (Shalakya Tantra) Ph. D

CONSENT FORM

I ……

……

Staying here giving in written that, I am involving in the study of "Efficacy of Goghruta Aschyotana in Computer Vision Syndrome" by my own responsibility. This study will be carried out in Bharati Ayurveda Hospital.

All the criteria in this consent from are duly explained to me. I am aware of the possible complications in this study. Permission regarding all the tests and treatments has been taken from me and am undergoing with my own interest.

1) I am aware that doctor is going to examine me.
2) I will follow all the orders and information given by the concerned doctor; also I agree to undergo all the investigations and treatments.
3) Any doctor from Bharati Ayurved Hospital will be permitted to do treatment on me.
4) Patients will be divided in 3 different groups. One group will be treated with study drug and another groups with some given drug or treatment. I may be involved in any group so I may or may not receive the study medicine.
5) There are so many treatments on computer Vision Syndrome and it is one of them. I know that I may not get the total relief.
6) All the conclusions of this study will be kept secret and is used only during the study. The person signing below, doctor has explained about the study and answered all my queries.

The consent form has been duly read and understood by me. I am aware of this study and I am involving with my own interest. All the empty spaces in this consent paper have been previously filled before my signature.

In this study I am involving with my own interest and signing and consent paper.

Doctor
Name, Sign, Date

Patient
Name, Sign, Date

Witness 1

Witness