



ISSN 2278 – 0211 (Online)

Computer Vision Syndrome

Dr. Yashi Bansal

Assistant Professor, Department of Ophthalmology, Punjab Institute of Medical Sciences Jalandhar, India

Dr. Tania Moudgil

Assistant Professor, Department of Ophthalmology, Punjab Institute of Medical Sciences Jalandhar, India

Abstract:

In the present era, the use of the computers in the home and office has increased and is associated with increased health risks especially for eyes. The human eyes were designed for more of near sight work. We sailed through centuries with minimal difficulties as the eyes could adapt to the changes in our near tasks as this requirement was not that much. One eye problem, called Computer vision syndrome is afflicting more and more people as these people are constantly in front of computer screens and hence have requirement of more near work. This paper reviews the principle ocular problems related to prolonged computer use and management of these problems. Accommodation and vergence responses to electronic screens appear to be similar to those found when viewing printed material, whereas prevalence of dry eye symptoms is greater during computer use. This is probably due to dynamics of the computer screen and decrease in blink rate due to constant viewing of the monitor positioned in primary gaze leading to increased corneal exposure and hence the multitude of ocular problems.

Keywords: computer vision syndrome, Blink rate, video display terminal, ergonomics, vergences, refraction

1. Introduction

Computer vision syndrome describes a symptom complex of various eye and vision related problems that result from prolonged computer use. The level of discomfort is proportional to the amount of computer use.

Viewing a computer screen is different than reading a printed page because of following factors

- The letters on the computer screen are not as precise or sharply defined. They are brightest at center and diminish in intensity towards the edges.
- The level of contrast of the letters to the background is reduced.
- Presence of glare and reflections on the screen.
- Different viewing distance and angles.
- Decrease in blink rate: Normally a person blinks 12-15 times/minute but while working on computer, the blink rate comes down to 5 times/minute because of continuous staring at screen. Blink rates have been found to decrease with reduced font size, reduced contrast, increased cognitive demand of task, and spacing between character and lines.

1.1. Prevalence

According to the National Institute of Occupational Safety and Health, computer vision syndrome affects about 90% of the people who spends three hours or more a day at a computer.ⁱ Another study in Malaysia was conducted on 795 college students aged between 18 and 25 years. The students experienced headaches along with eyestrain, with 89.9% of the students surveyed feeling any type of symptom of CVS.ⁱⁱ

1.2. Clinical features

1.2.1. Symptoms

- Eye irritation (dry eyes, itchy eyes, red eyes)
- Headaches
- Blurred vision

- Backaches
- Neck and shoulder pain

1.2.2. Signs

- Tear film may show presence of stringy mucous and particulate matter. Marginal tear strip may be reduced.
- Conjunctiva is lustreless and mildly congested.
- Cornea may lose sheen and may show punctate erosions.
- Convergence insufficiency may be seen. Watten et al reported significant decrease in positive and negative relative vergence (vergence range) at near both at the beginning and end of an 8 hour workday. It implied that computer use decreased the subjects ability to converge and diverge appropriately.ⁱⁱⁱ

1.2.3. Extent to which an Individual Experiences these Symptoms Depends on

- Visual abilities of the patient
- Amount of time spent in looking at computer screen

1.2.4. Contributory Factors

- Uncorrected refractive error
- Uncorrected spectacle power
- Inappropriate glasses for computer use
- Difficulty in eye coordination at near work
- Poor work station set up

1.3. Management

1.3.1. Diagnosis

- History
 - Symptoms which the patient is experiencing
 - Nature of job
 - Environmental factors
 - General health problems
- Visual acuity measurement
- Refraction
- Ocular examination to ascertain how eyes focus, move and work together with emphasis on convergence responses.

1.3.2. Treatment

While it is yet to establish CVS as a cause of any permanent eye damage, the pain and discomfort associated with the problem can effect workplace performance or enjoyment of home activities. With few preventive measures and lifestyle changes, symptoms of CVS can be alleviated.

1.4. Eye Care

1.4.1. Eye Glasses or Lenses

Eye glasses or contact lenses designed to meet unique visual demands of computer viewing. A pair of computer glasses should include

- Prescription measured at computer viewing distance.
- Appropriate lens type for patient
- A tint where required
- Anti reflective coating
- Prisms if needed
- Optical center of each lens placed directly in front of eye.

Wiggins *et al* reported that there was a significant increase in symptoms during the computer task if there was a residual astigmatism of up to 1D. This is a common practice while prescribing soft contact lenses. The authors suggested that toric lenses or spectacle overcorrections be used in these cases.^{iv}

1.4.2. Vision Therapy

Besides using eyeglasses or lenses, some users experience problems with eye focussing or eye coordination that are not corrected with above measures. Eye exercises help remediate deficiencies in eye movement, eye focussing and eye teaming, hence reinforcing

the eye brain connection. Exercises can be advised to be performed at hospital or home training procedures with special emphasis on increasing convergence power.

1.5. Ergonomic Factors

These contribute a lot to symptoms of CVS. With increasing use of computers by young adults in educational institutes as well as at home, certain modifications in the ergonomic factors may help a lot in getting rid of symptoms of CVS. JA Rahman et al conducted a study to explore ergonomic factors that may contribute to CVS and found that prevalence of CVS was very high (two in every three). Using computer more than 5 hours per day, not facing computer screen while computing, screen glare and high monitor level may predispose someone to get CVS^v. Another such study was conducted by Logaraj M et al and they concluded that students who viewed the computer at a distance of less than 20 inches, viewed upwards or downwards to see the computer, who did not avoid glare and did not take frequent breaks were at higher risk of developing CVS. Students who did not use adjustable chair, height adjustable keyboard and anti glare screen were at higher risk of developing CVS.^{vi} Hence ergonomic modifications are of great value in treating patients with CVS.

1.5.1. Proper Body Positioning

Improving posture by using adjustable equipment to reduce strain on the back, neck, shoulders and eyes. Adjust the height of chair so that the knees are bent at a 90 degree angle with the feet flat on the floor or foot rest. Sit straight against a backrest with the forearms on the armrest and the elbows bent at a 90 degrees angle. The keyboard and mouse should be located lower than the elbow and within easy reach of the hands. The head should be tilted slightly down while looking at the center of the computer screen.

Bilton has proposed a term '1, 2, 10' (One to Ten) to describe the commonly used distances for the current electronic forms of written communication. Mobile phones at a distance of one foot (about 30cm), two feet (about 60cm) to two and a half feet for desktop devices and laptops, and 10 feet (about 3 meters) for the television screens.^{vii}

1.5.2. Reference Material

It should be kept as close to screen as possible. Materials should be located above the keyboard and below the monitor. This will lessen the need to constantly refocus the eyes. Using a document holder besides the monitor can be helpful.

1.5.3. Lightening and Antiglare Screen

Visor test can be done to determine if the current lightening in the room is a problem. The test is conducted by cupping hands over the eyes like a baseball cap to block the lights while looking at the monitor. If an improvement is immediately noticed, then lightening changes should be made. Modifications in lightening the room, closing window shades, changing contrast or brightness of the screen or attaching a filter or hood to the monitor.

1.5.4. Breaks and Blinking

Avoiding eyestrain by preventing continuous use of eyes by taking short breaks. One of the catch phrases is '20-20-20' rule, every 20 minutes, focus the eye on an object 20 feet (6 meters) away for 20 seconds OR Blink everytime u hit the "ENTER" key or mouse click.

1.5.5. Use of Elastoviscous Lubricating Eye Drops

Contact lens users working on computer are more likely to suffer a high severity of ocular discomfort. The cause was believed to be lack of lubrication. In borderline dry eye states, the use of soft contact lenses aggravates the symptoms experienced. Dry eye symptoms are more common in contact lens wearers than in the general population.^{viii} Elastoviscous lubricating eye drops and eye ointments have been prescribed to computer users frequently to alleviate dry eye or as a placebo. Several studies have been done some of which support this view while others refute it. Guillon et al reported that the use of povidone 2% preservative free eye drops was associated with an improvement in symptoms during sustained computer use^{ix}. Looking down while reading a mobile computing device reduces the exposed corneal surface and negates the effect of reduced blinking rate. In desktop computers more corneal surface is exposed as the person is looking straight and thus an evaporative dry eye can occur. It was postulated that polyvinyl alcohol, dextran, polyvinyl pyrrolidone would be better in this subgroup rather than carboxymethylcellulose. However, convincing objective evidence is still awaited.^x

Hence all the above factors should be kept in mind while treating a patient with CVS. A study was conducted by Bali et al to study knowledge, attitudes and practices in Indian ophthalmologists regarding computer vision syndrome and it was concluded that all ophthalmologists were aware of CVS, but computer using ophthalmologists were more informed of symptoms and diagnostic signs but all were misinformed about treatment modalities.^{xi}

2. Conclusion

Computer has become a necessary evil. Working at a computer terminal is not free from health hazards and it leads to repetitive stress disorder characterised by symptom complex of eye- strain, tired eyes, irritation, burning sensation, redness, dry eyes, blurred and double vision apart from non ocular complaints like neck, shoulder and back pain collectively termed as computer vision syndrome. It is caused by multiple factors which include ergonomic factors, individual responses and the time spent by individual on computer. The

treatment needs to be tailored to the individual patient. The problem of CVS is very new to medical science and is under investigation to explain the mechanism of disease and to find a solution. The ophthalmologist apart from addressing his own part needs to educate patients about ergonomics modifications for better understanding of the disease process and management of the same.

3. References

- 1.Travers PH, Stanton BA. Office workers and video display terminals: physical, psychological and ergonomic factors. *AAOHN J*. 2002; 50: 489-93.
- 2.Himebaugh NL, Begley CG, Bradley A, Wilkinson JA. Blinking and tear break up during four visual tasks. *Optom Vis Sci*. 2009; 106-114.
- 3.Costanza MA. Visual and ocular symptoms related to the use of video display terminals. *J Behav Optom*. 1994; 5: 31-6.
- 4.Becoming a squinter nation (internet). *Wall Street Journal*; August 17, 2010. Available from:(http://online.wsj.com/article/SB100014240527487048686045754333361436276340.html/mod=WSJ_hpp_MIDDLENexttoWhatsNewsThird).
- 5.Reddy SC, Low CK et al. Computer vision syndrome: a study of knowledge and practices in university students. *Nepal J Ophthalmol*. 2013;5(10):161-168.
- 6.Watten RG, Lie I, Birketvedt O. The influence of long term visual near- work on accommodation and vergence: A field study. *J Hum Ergol (Tokyo)*. 1994;23:27-39.
- 7.Wiggins NP, Daum KM. Visual discomfort and astigmatic refractive errors in VDT use. *J Am Optom Assoc*. 1991;62:680-4.
- 8.Z A Rahman. Computer vision syndrome: the association with ergonomic factors. *J Epidemiol Community Health*. 2011;65:A357
- 9.Muthunayanan Logaraj, V Madhu Priya, N Seetharaman, Shailendra Kumar Hedge. Practice of Ergonomic Principles and computer vision syndrome (CVS) among undergraduates students in Chennai. *Natl J Med Res*. 2013; 3(2): 111-116.
- 10.Bilton N. *I live in the future and here is how it works?* New York: Crown Business. 2010:1-293.
- 11.Orsborn GN, Zantos SG. Practitioner survey: management of dry eye symptoms in soft lens wearers. *Contact Lens Spectr*. 1989;4:23-6.
- 12.Guillon M, Maissa C, Pouliquen P, Delval L. Effect of povidone 2% preservative free eye drops on contact lens wearers with computer vision syndrome: pilot study. *Eye contact lens*. 2004;30:34-9.
- 13.Tsubota K, Nakamori K. Dry Eyes and Video Display Terminals. *N Engl J Med*. 1993; 328:584-5.
- 14.Bali J, Navin N, Thakur BR. Computer vision syndrome: a study of knowledge, attitudes and practices in Indian ophthalmologists. *Indian Journal of Ophthalmology*. 2007;55(4):289-93.