

## ALL ABOUT COMPUTER VISION SYNDROME

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### INTRODUCTION :

Over the past 20 yrs, there has been a great advancement in information technology. Computer has become almost an indispensable piece of equipment both in office and home. Use of computer has no doubt revolutionized the society; however it does associate with health problems. Musculoskeletal problems such as tingling and numbness of the fingers, cervical stiffness and headache are well known to be associated with prolonged usage of computer<sup>1</sup>. More recently visual and ocular problems are reported as the most frequently occurring health problem among computer users<sup>2</sup>. Vision related problems occur in over 70% of computer workers<sup>17</sup>.

### What is Computer Vision Syndrome ?

The American Optometric Association defines computer vision syndrome (CVS) as a complex of eye and visual problems related to activities which stress near vision and which are experienced in relation or during the use of computer<sup>4</sup>. Main ocular symptoms reported by workers are eye strain, irritation, burning sensation, redness, redness, blurred vision, double vision<sup>5</sup>.

If one spends two or more hours every day in front of a computer, one might suffer from CVS. A 2003 study by Delia E. Treaster of Ohio State University cited a report by T. Nakazawa stating workers who spend more than 5hrs per day before a computer suffered significant and severe eyestrain<sup>18</sup>.

The symptoms of CVS are generally temporary and disappear at the end of the working day, even though a minority may experience continuation of symptoms

after work. If no intervention is initiated, a majority of these symptoms will recur and also worsen in future<sup>4</sup>.

### Pathophysiology of CVS.

Symptoms experienced in CVS are caused by three potential mechanisms

<b>Mechanism</b>	<b>Symptoms</b>
1. Extra ocular	Neck stiffness Neck pain Shoulder pain Headache Backache
2. Ocular surface changes	Tearing Gritty sensation Dryness Redness Burning Contact lens related problems
3. Accommodative mechanism related	Blurring of vision Double vision Presbyopia Myopia Slowness of focus change

Extra ocular mechanism causes musculoskeletal symptoms which are associated with improper placement of computer screen which lead on muscle sprain. Pain in computer users is diminished when gazing at 14° or more<sup>19</sup>. Presbyopic patients using bifocals find it difficult to focus on screen. Bifocals are designed for distant vision and near vision at 12-14 inches. Computer screen is 20-24 inches apart. Bifocals have to constantly move back

and forth and change their postures to focus on screen. This causes neck stress and eye fatigue<sup>17</sup>.

Dry eye appears to be the major contributor to abnormalities of the ocular surface. Among the common factors leading to dry eye are decreased blink rate (6-8 per min)<sup>20</sup>, increased surface of corneal exposure caused by horizontal gaze at the computer screen, decreased tear production due to ageing process, contact lens usage, medications like antihistamines, meibomian gland dysfunction<sup>21</sup> and systemic illness such as connective tissue disorder<sup>6-8,11</sup>.

Accommodation, vergence, frequent saccadic eye movements make working on a computer visually demanding. Eye movements, focusing and eye alignment process involve repetitive muscular activity (extra-ocular and ciliary's muscles). In order to accomplish specific computer tasks, frequent eye movements from work documents to screen or from screen to the keyboard and back again is used. In addition subject being viewed changes, so does the need for a change in eye focusing to maintain a clear image. These changes occur repeatedly in computer use<sup>17</sup>. In one study it was reported that a transient myopia was observed in 20% computer users at the end of work shift<sup>6</sup>.

## Discussion

Vision problems occur frequently in Visual Display Terminal (VDT) workers. 50-90% of VDT workers have CVS. On a computer, a CRT with a low refresh rate (less than 70Hz) causes flickering image<sup>22</sup>. Higher refresh rates is associated with less flickering image and is more user-friendly. Extremely low refresh rates is known to be associated with headache, fatigue, irritability and epileptic seizures<sup>6</sup>. LCDs do not go out of focus and are not susceptible to visual flicker<sup>22</sup>. Low resolution, glare, contrast also contribute to visual symptoms.

## Misconceptions

Many people are worried that the computer screen emits radiation. Numerous published articles have shown that there is no evidence to support any direct link between the radiation levels emitted and the workers health problem. Similarly there is no evidence that computer radiation contributes to significant cataract formation<sup>6,12,13</sup>.

## Patient Work-up

Patients complaining of symptoms suggestive of CVS must have the following tests done- Subjective discomfort questionnaire,

- Refraction,
- Detailed slit lamp examination including TBUT,
- fluorescein staining,
- lissamine green staining.

## Management

Most important approach is the elimination of the causative factor leading to symptoms. Many symptoms can be prevented by proper strategies at the work-place.

## Preventive measures include

1. Environmental modification
2. Proper self eye care

## Environmental modification

Among the most important modifiable external environmental factors is lighting. Bright lights, windows and overhead fluorescent lights often contribute to discomfort glare. These bright light sources need to be controlled with proper blinds, filters or adjustment of the room arrangement so that an acceptable level of lighting is obtained to minimize visual fatigue. Different age group may require different light intensity to work with, workers over 50 years of age tends to require twice the light levels of young adults to perform the same task<sup>14</sup>.

Place the printed copy upright as close to the monitor as possible with a soft desk lamp shedding light on the printed copy<sup>18</sup>.

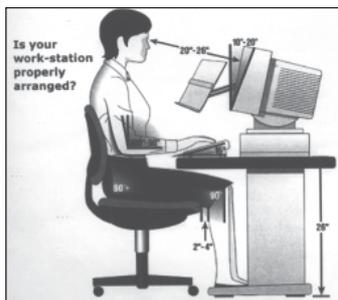
Use of screen filters can reduce glare and reflection of the computer screen, but it should be used as a supplement and not a replacement for poor lighting of the room<sup>10</sup>. Screen brightness and contrast should be adjusted to provide balance with room lighting and maximum visibility. Try enlarging the text size. When possible use back text on white background<sup>18</sup>.

Position of the computer monitor must be 20-24 inches from the eyes and the screen should be 10-20° below the eyes or the centre of the screen should be 5-6 inches below the eye.

Clean the computer screen frequently<sup>18</sup>.

### Proper eye-care

Take frequent breaks  
- The National Institute of Occupational Safety and Health recommends that a computer worker should take a minimum of four 5 mins breaks in addition to the customary two 15 mins breaks per day. If that is not possible, one should take a 5 mins break every hour of computer work.



American Optometric Association (AOA) recommends a 15 mins break for every 2 hrs of computer use. AOA also suggests the 20-20 rule-every 20mins or so look away from the screen and focus on something in the distance for about 20seconds<sup>18</sup>.

Lubricating drops (preferably) preservative free (once) can take care of dry eyes

Workers who are contact lens users must be more careful with any ocular symptom which started acutely

such as pain and redness. Complications following prolonged contact lens usage such as cornea ulcer must be excluded by proper ophthalmologic assessment and examination before one can say that the symptoms are due to computer vision syndrome<sup>16</sup>.

Use of proper corrective glasses for refractive errors such as myopia, astigmatism and presbyopia is important of prevent further deteriorating of the ocular symptoms which can lead to poor work performance and the poor quality of life. Workers who have history of medical illness such as diabetes mellitus and connective tissue disease affecting the eyes must get referral to see ophthalmologist without delay.

Using progressive type of multifocal lenses and frames that can be adjusted to provide an adjustable pantoscopic angle is the most suitable form of visual correction for presbyopic computer users<sup>17</sup>.

Yoga practice daily for an hour, five days a week helps to reduce visual discomfort<sup>23</sup>.

### Conclusion

Computer vision syndrome is a new problem that has emerged in this century following increase usage of computer both at home and at work. There is a correlation between ocular symptoms such as pain, redness, dryness, blurring of vision, double vision and other head and neck sprains and computer usage. Prevention remains the main strategy in managing of computer vision syndrome. Modification in the ergonomics of the working environment, patient education and proper eye care important strategies.