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Effect of Green Tea Consumption on the Tear Film Stability and Quantity of Tear Production in Normal Subjects

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Abstract

Purpose: The purpose of this present study is to determine the effect of single cup of green tea on the tear film stability and the quantity of tears production.

Methodology: A prospective observational study was carried out at the Department of Optometry and vision sciences, The University of Lahore. 30 participants were enrolled in this study. The subjects who had fulfill the inclusion criteria were examined for baseline measurement half an hour before the green tea intake. The tear film stability and the quantity of tears production were accessed by using tear breakup time and schirmer test respectively. After the initial baseline investigation, a cup of green tea was given to the participant and the measurements was taken again after 1 hour of green tea consumption under same examination room at same room temperature.

Results: A 30 normal healthy subjects were enrolled in this study. Out of 30 participant there were 18 (60%) females and 12 (40%) of males of age ranges $20-40$ years. The mean age of the patients was 28.1 ± 5.06. The mean of baseline tear breakup time of right eye was 14.63 ± 2.06 sec and after 1 hour of green tea consumption was 13.06 ± 1.76sec. Similarly, the baseline means value of quantity of tear production of right eye by using scheimer test was 18.06 ± 1.96 and after 1 hour of green tea consumption was 15.9 ± 2.41. The mean baseline

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measurement of quantity of tear production (Schirmer test) of left eye before 30 mint green tea consumption was 18.06 ± 1.42mm and after 1 hour of drinking green tea was 16.1 ± 1.62mm respectively. Similarly, the stability of tear film (TBUT) was assessed before 30 mint of green tea consumption and after the 1-hour green tea consumption of initial baseline measurement of left eye was 15.4 ± 1.96sec and 13.9 ± 0.98sec respectively. Paired Sample t test shows a significant association of stability of tear film and tear production after the consumption of green tea.

Conclusions: There was a significant effect of green tea on tear film stability and the quantity of tears production. The quantity of tears production reduced significantly.

Keywords:-Green Tea, Tear Breakup Time, Tear Film Stability, Schirmer Test, Quantity of Tear Production.

Introduction

Tea is produced from (camellia simesis) is one of the most common consumed beverages worldwide[1]. There are variety of tea available that is consumed in different part of the world as green, black and oolang[2]. Green tea has numerous health benefits it protects against the degenerative diseases, cardiovascular diseases, provide protection against breast cancer, reduce body fat, reduced oxidative stress, neuroprotective and has cholesterol lowering effect[3,4,5]. Although green tea has numerous benefits but there is certain unknown adverse effect of green tea[6]. A highest intake of green tea might cause harmful adverse effect i.e. oxidative DNA damage, thyroid enlargement, decreased iron and may also cause the ocular disturbance by alters the tear films layers[7,8].

Tear film is very important for ocular defence system and provide a protective mechanism against the foreign body. In addition, it keeps the surface of cornea lubricate, clean and smooth[9]. A tear film instability led to variety of symptoms including discomfort, burning sensation and visual disturbance[10]. The instability of tear fil may also lead to the physical disruption of ocular surface causing the insufficient tear production due to lacrimal gland dysfunction and excessive tear evaporation from the ocular surface[11,12]. A reduction of tear production and excessive tear evaporation as well as tear instability can lead to dry eye disease[13]. The symptoms of dry eye can be reduced with artificial lubricant eye drop that may improve the symptoms such as burning sensation, irritation and redness[14].

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Dry eye is the most common occurring eye disease worldwide[15]. Approximately it was estimated that in the united stated about 7% of the individual over the 18 years of age have diagnosed with dry eye disease[16].

Current study determines the effect of single green tea cup on the tear film stability and the production of tears. The polyphenol content present is the green tea disturb the layer of tear film causing the instability of tear film.

Materials and Methods

A prospective observational study was conducted at Department Optometry and vision sciences, The University of Lahore. A total of 30 normal subjects 18 females and 12 males were the part of the study from the age ranges $22-40$ years. All the subjects who were the part of study were treated based on Declaration of Helsinki. Ethical approval was obtained from the ethical review committee of the University of Lahore.

A signed informed consent was taken from every participant for their inclusion in the study. After the informed consent from every participant a slit lamp examination was carried out to rule out the abnormalities of eyelid, conjunctiva and cornea. The subject who had recently done any ocular surgery, refractive surgery, contact lens users or any type of other allergies and already taking tear substitutes were excluded from the study. The participants who had fulfil inclusion criteria a base line finding of both eyes was measured half an hour before the green tea consumption by using schirmer test and tear breakup time to access the quantity of tear production and tear film stability respectively. The participant with normal tear film stability (TBUT) and normal tear production (Schirmer test) greater than 10 sec and normal tear secretion of greater than 15mm by using schirmer strips were undergone for an initial baseline measurement. After the baseline investigation a single cup of green tea 1.5g in 100ml hot water was provided to the participants in a covered cup to eliminate the effect of green tea steam. The participants were instructed not to drink water and any other beverages after the initial baseline measurement to avoid the body boasting mechanism. The participants were also instructed to avoid any physical and emotional stress activity after the green tea consumption. The same test was performed after 1 hour of green tea consumption and the measurement was accessed again under the same examination room at same temperature. The data was entered in SPSS version 22 and paired sample t test was applied to analysed the result.

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Results

30 normal healthy subjects were enrolled in this study. Out of 30 participant there were 18 (60%) females and 12 (40%) of males of age ranges $20-40$ years. The mean age of the patients was 28.1 ± 5.06. The mean of baseline tear breakup time of right eye was 14.63 ± 2.06 sec and after 1 hour of green tea consumption was 13.06 ± 1.76sec. Similarly, the baseline means value of Schirmer test of right eye was 18.06 ± 1.96mm and after 1 hour of green tea consumption was 15.9 ± 2.41mm reported in Table 1.

Table1. Tear film stability and quantity of tear film production of right eye

Right Eye	Baseline Measurement	After 1 hour
Tear Breakup time (TBUT) (sec)	14.63 ± 2.06	13.06 ± 1.76
Schirmer Test (mm)	18.06 ± 1.96	15.9 ± 2.41

The mean baseline measurement of quantity of tear production (scheimer test) of left eye before 30 mint green tea consumption was 18.06 ± 1.42mm and after 1 hour of drinking green tea was 16.1 ± 1.62mm respectively. Similarly, the stability of tear film (TBUT) was assessed before 30 mint of green tea consumption and after the 1-hour green tea consumption of initial baseline measurement of left eye was 15.4 ± 1.96 and 13.9 ± 0.98 respectively reported in Table 2.

Table 2. Tear film stability and quantity of tear film production of left eye

Left Eye	Baseline Measurement	After 1Hour
Tear Breakup Time (TBUT)(sec)	15.4±1.96	13.9±0.98
Schirmer Test (mm)	18.06±1.42	16.1±1.62

A paired sample t test was applied to determine the effect of green on tear film stability and the quantity of tear production after the consumption of green tea. There was a statistically significant ($p - 0.01$) correlation of tear film stability between baseline measurement and after 1

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hour of green tea consumption. There was also a significant ($p - 0.02$) reduction of tear production before the baseline measurement and after 1 hour of green tea consumption.

Discussions

The severity of dry eye depends on the instability of the tear film due to the dysfunction of the tear film. The dysfunction of the tear film is due to the damage the corneal cell[17]. There are many factors which may leads to the dysfunction of the tear film. The most common factors that contribute to damage corneal cell is redness and inflammation of the cornea[18]. Dry eye is the most common disease that cause the dysfunction of tear fil stability and the dysfunction of the natural mechanism of tears production[18].

The current study determines the effect of green tea on the tear film stability and the quantity of tears production after the green tea consumption in healthy subjects which shows that there was a statistically decrease the quantity of tear productions after the consumption of green tea. This study result relates to the other study results which shows that there was a statistically significant higher tear ferring grade after the consumption of green tea[19]. Another similar study conducted which shows unhealthy tear ferring pattern by using phenol red thread test. The result of this study relates to this current study that the green tea consumption had a significant negative effect the stability of tear film and the quantity of tears production[20].

Although the result of this current study suggests that the consumption of green tea could had negative effect on the quality of tear film stability as well as the quantity of tear production. However, there is still need to be study the direct association of green tea between the quality of tear film stability and the quantity of tears production after the green tea consumption. The limitation of this current study is a small sample size and other study should also be conducted in patients already had dry eye to determine how much green tea consumption may affect the subjects who had already the symptoms of dry eye disease.

Conclusion

There was a significant effect on tear film stability before and after the green tea consumption. The quality and quantity of tear production reduced significantly.

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Limitations and Future Studies

The number of participants was relatively small and there was no control group. We only observed the changes after a single administration of green tea. Further studies should be conducted to investigate the impact of various doses of green tea on the tear film stability or quantity of tear production.

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