Examining Corneal Surface Temperature Variations Resulting from Fingertip, Knuckle, and Fingernail Eye Rubbing

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Introduction:

Eye rubbing has been consistently associated with the development & progression of keratoconus across multiple studies.[1-3] Although the mechanism is mostly due to mechanical forces, cyclic temperature increases may contribute to corneal biomechanical weakening.

The purpose of this study was to comparatively assess the magnitude of corneal temperature variations induced by three different eye rubbing techniques.

Methods:

A total of 86 subjects (44 male, aged 18 - 24 years) were enrolled into the study. Subjects were requested to rub their eyes for 20 seconds using their fingertip, knuckle, and fingernails **(Figure 1 A, B and C, respectively)** in a randomized fashion with their dominant hands. At each session, 20 seconds resting period was given for determining the baseline corneal temperature and the intervals between each session were set to 10 minutes.[4]

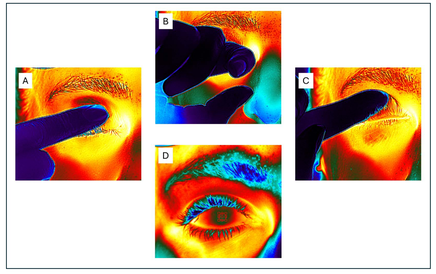


Figure 1: Workflow of the study

The average, minimum and maximum corneal surface temperatures within a 3 mm diameter region-of-interest circle centred on the cornea **(Figure 1 D)** were measured using a high-resolution thermal camera (FLIR A8200c), immediately after the rubbing procedure had stopped. The variations in corneal temperature across three different rubbing techniques, as well as the effect of gender, were compared using repeated measures ANOVA (statistical significance at $p<0.05$).

Results:

The mean baseline corneal temperature was 34.4±0.7 °C and the increase from baseline was 1.0°C, 0.97°C and 1.03°C for fingertip, knuckle, and fingernail eye rubbing, respectively (all $p<0.001$, **Table and Figure 2**).

	Fingertip			Knuckle			Fingernail		
	Pre	Post	p value	Pre	Post	p value	Pre	Post	p value
Average temperature (°C)	34.3	35.3	<0.001	34.4	35.4	<0.001	34.3	35.4	<0.001
Minimum temperature (°C)	34.1	35.2	<0.001	34.2	35.2	<0.001	34.2	35.2	<0.001
Maximum temperature (°C)	34.5	35.5	<0.001	34.6	35.6	<0.001	34.5	35.5	<0.001

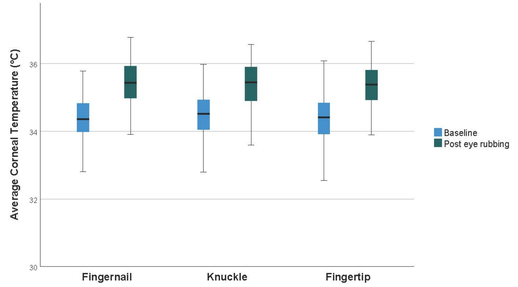


Figure 2: Corneal temperature changes with eye rubbing

Although females had a slightly lower baseline corneal temperature (34.5°C vs 34.2°C, p= 0.009), there was no effect of gender on corneal temperature variations with any of the eye rubbing techniques.

Conclusions:

Eye rubbing causes an approximately 1°C increase in corneal surface temperature, regardless of the specific eye rubbing technique employed. Coupled with the mechanical forces, the cyclic temperature increase induced by habitual eye rubbing may be detrimental for corneal biomechanical integrity, contributing to its association with keratoconus.

Acknowledgements:

This study was supported by Scientific and Technological Research Council of Turkey (TUBITAK) under the Grant Number 1919B012325181 (2209-A). The authors thank to TUBITAK for their supports.

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