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Original research

Objective and subjective assessing efficacy of a lubricating drop in eyes wearing silicone hydrogel contact lenses

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Abstract

Purpose: To investigate the effect of a lubricating drop on optical quality, tear film stability, and subjective symptoms in individuals wearing silicone hydrogel contact lens.

Methods: In this one-day, prospective single-center clinical study, Pre-lens Tear Deformation Time (PL-TDT), Root-Mean-Square (RMS) of Low Order Aberrations (LOA) and High Order Aberrations (HOA), individual twelve Zernike coefficients, and subjective symptoms were assessed in 43 volunteers (mean age 19.58 ± 1.63, 86 eyes) at 6 h after inserting the contact lens and then at 60 min after instilling a lubricating drop (Comfort drops, Avizor, Madrid-Spain).

Results: PL-TDT, LOA-RMS, and HOA-RMS values measured before drop instillation were not significantly different with those measured after drop. None of the Zernike coefficients were significantly different after instilling lubricating drop. Statistically significant decrement in both frequency and severity values in blurry vision, dryness, discomfort, burning, itching, foreign body sensation, excessive blinking, and lacrimation were seen after drop instillation (all $P < 0.05$).

Conclusion: Our results showed that although the lubricating drop did not improve the tear film stability and optical quality in the silicone hydrogel contact lens wearers, subjects experienced a subjective improvement.

Keywords: Lubricating drop; Tear Deformation Time; Symptom; Silicone hydrogel contact lens; Wavefront aberrations

Introduction

The tear film is the most important refractive surface of the eye. Owing to the high difference in refractive index at the air-tear interface, this surface is considered the cardinal refractive component of the eye.[1] Any local or global disruption in the tear film can give rise to both optical (e.g. high order aberration increment) and pathological (e.g. ocular surface inflammations) problems in the eye.[2–4]

Optical changes ultimately lead to degrade the retinal image quality.[5] A healthy, uniform, and stable tear film is crucial to achieve clear retinal image. Visual symptoms such as blurry, foggy, misty, and fluctuating vision experienced with some dry eye patients have been attributed to the tear film alterations.[6,7] Pathological problems induced by the tear film disruptive changes cause a variety of ocular symptoms, such as

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burning, itching, and redness. It has been shown that any intervention in the tear film can prevent optical and pathologic disruptions and alleviate the ocular and visual symptoms.[8–10]

Contact lens induced tear film abnormality (CLITFA) has been known as the main reason for discontinuation of the contact lens wear.[11,12] Approximately fifty percent of contact lens wearers experience symptoms of CLITFA.[13] Lacrimation, burning, itching, blurry vision, foggy vision, fluctuating vision, discomfort, dryness, grittiness, foreign body sensation, and redness are the well-known complaints of the patients suffering from CLITFA.[14,15] Recently-conducted studies showed that subjective CLITFA symptoms are the better diagnostic way than clinical testing.[16,17] In fact, a patient with CLITFA, irrespective of having the subjective symptoms, may have normal results in clinical examination[16]

Lubricating drop instillation is recognized as being the most common strategy in the management of CLITFA.[18,19] Previous studies have demonstrated that these viscous substances do not improve the tear film stability and optical quality for an elongated period.[20,21] A study was conducted by Golding et al. which showed that the efficacy of these drops is lower than 10 min.[20] It has been proven that there is no difference in the efficacy of these lubricating formulations with saline.[20] Some authors reported that the lubricating drops can decrease tear osmolarity, lower protein deposition, and consequently, abate the complaints of the patients.[22–24] Caffrey and Josephson compared the efficacy of ten different lubricating formulations and found no remarkable difference between them.[25] There were a few studies addressing the long-term (such as 1 h) effect of the lubricating drops on the tear film and subjective complaints.

The present study seeks to address the long-term influence of a lubricating drop (Comfort drops, Avizor, Madrid-Spain) on the pre-lens tear film stability, optical quality, and subjective symptoms in inexperienced normal individuals wearing silicone hydrogel contact lenses (Air Optix Aqua, Lotraflicon B, CIBA vision).

Methods

Study design and subjects

Forty-three volunteers (86 eyes), comprised of 24 females and 19 males aged from 18 to 22 years (mean age = 19.58 ± 1.63) from students of Rehabilitation School of Iran University of Medical Sciences were recruited in this one-day prospective single-center study. All of the volunteers were normal and had never worn contact lens before. Having standard visual acuity (10/10), healthy ocular surface, keratometry range from 41 to 45 D, maximum spherical refraction 0.25 D (minus and plus), and cylindrical 0.50 D (minus) were considered inclusion criteria. The volunteers who had ocular surface inflammatory or infectious diseases, dry eye, and intraocular pathologies were excluded. Patients who had undergone corneal refractive surgery and other ocular surgical interventions before the time of enrollment were not eligible for participation. Written informed consent was obtained for each individual before participation. The data obtained and used in this study is in adherence to the Declaration of Helsinki. Ethical clearance was obtained through the Office of Research Ethics at Iran University of Medical Sciences.

Visit 1: preliminary examinations

Both right and left eyes in all subjects initially underwent preliminary examinations, including assessment of Visual Acuity, Refraction, Keratometry, Slit Lamp Examination (SLE), and ocular surface staining with fluorescein. After completing the overall observation of ocular surface by slit lamp, a fluorescein-impregnated strip (Fluorescein, HAAG-STREIT AG, Switzerland) was wetted with unpreserved saline. The strip was applied against the superior bulbar conjunctiva while the patient was instructed to look down. The subject was asked to blink three times to spread the Fluorescein. A wide full aperture of the slit lamp illuminating whole area of the cornea with cobalt blue filter was used for observation. Existence of any staining on the corneal and conjunctival surface was evaluated.

These examination outcomes were recorded on a sheet, including name, age, date, time, case history, visual acuity, refraction, keratometry, slit lamp examination (SLE), Pre-Lens Tear Deformation Time (PL-TDT), and aberrometric measurements.

Those volunteers who possessed inclusion criteria were entered into the study. Based on keratometry values, proper contact lenses (Plano, Lotraflicon B, Air Optix, CIBA vision) were inserted into both right and left eyes. Because of the medium keratometric range (41.00–45.00) selection in this work, the median base curve (8.6 mm) of available silicone hydrogel contact lenses was chosen.[26] After 20 min, fitting characteristics of contact lens including visual acuity, centration, movement, and lens-cornea fitting relationship (with retinoscope and keratometer) were evaluated. Each subject spent 6 h with the contact lenses and came back for a second visit in the afternoon.

Also addressed in the literature, the dryness-related symptoms of contact lens wearers tend to increase with increasing daily wearing time.[27,13] Moreover, in the some of the previous similar studies, the time point of 6 h was considered.[28] Regarding the mentioned reasons, we chose 6-hour contact lens wear to allow the tear film to be sufficiently affected by the contact lens.

Visit 2: measurements over the contact lenses

At this time the subjects were asked to complete a written symptom checklist. This checklist encompassed twelve questions about visual and ocular complaints. All of the questions had been written in Persian language. Blurry vision, vision fluctuation, burning and stinging, itching, redness, discomfort, foreign body sensation and grittiness, excessive blinking, dryness, absolute contact lens intolerance (i.e. during their contact lens wear, how often did their eyes bother them so much that they felt as if they needed to stop whatever they were doing and take out their contact lenses), and eye closure