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SCIENTIFIC LETTER

Corneal and conjunctival sensitivity in intolerant contact lens wearers

Sensibilidad corneal y conjuntival en pacientes con intolerancia a las lentes de contacto

Introduction

The role of the upper tarsal conjunctiva in ocular surface discomfort is unknown; however the upper lid may contribute to symptoms of dryness and discomfort in ocular surface disease and in contact lens (CL) wear. There is increasing evidence for the role of the conjunctiva in contact lens discomfort (reviewed in Stapleton et al.[1]). Although contemporary CL wear has minimal impact on corneal sensation threshold, there is an indication that it may affect the conjunctival threshold.[2–5] The aim of this preliminary work was to measure the threshold of the tarsal conjunctiva in CL wearers who had discontinued wear due to discomfort.

Methods

An air-jet aesthesiometer (CRCERT-Belmonte aesthesiometer) was used to measure ocular surface sensation threshold. This instrument is a modified version of the Belmonte aesthesiometer and has been described in detail elsewhere.[2] Stimulation of the ocular surface was carried out using a 1 s pulse of medical-quality air delivered at flow rates of 1–200 mL/min at 4 mm from the ocular surface. The stimulus was delivered at corneal temperature (34 °C).

Sensation threshold was measured using the method of constant stimuli, with a two alternative forced choice (yes/no) paradigm.[2] Subjects were masked to the stimuli presented, but for practical reasons it was not possible to mask the observer.

Subjects

Nine previous daily wear soft CL wearers and 10 non-lens wearers participated. The CL wear group consisted of two males and seven females with a mean age of 36 ± 7.5 years (range 27–49 years) who self-reported discontinuation of daily CL wear due to discomfort. The non-lens wear group consisted of eight females and two males with a mean age of 32 ± 6.1 years (range 26–43 years). No subject had a history of corneal or ocular pathology. The procedure was approved by the UNSW human research ethics committee and all subjects gave their informed consent, in accordance with the guidelines.

Experimental design

Sensation thresholds were determined at the central cornea (corneal apex), inferior cornea and inferior bulbar conjunctiva (2 mm above and below respectively a tangent to the inferior limbus) and the tarsal conjunctiva (midpoint of the everted upper eyelid). The upper eyelid was returned to its normal position after a maximum of two pulses delivered to the tarsal conjunctiva and the subject was allowed to blink normally. On average 20 lid eversions were required to determine tarsal conjunctival threshold for each subject, with measurements taken over two sessions, each lasting approximately 20 min. All measurements were performed by one examiner on the right eye only in the afternoon.

Data analysis

Two-way analysis of variance (ANOVA) was used to detect differences in threshold between ocular sites. The Bonferroni Post Hoc test was used to determine between group differences. Significance was determined at a 90% level of confidence in this exploratory analysis to facilitate identification of potential differences in sensitivity between ocular sites and different subject groups.

Results

Sensation thresholds were significantly different between ocular sites and between subject groups (ANOVA, $p < 0.001$). Thresholds at both corneal sites were significantly lower than at the conjunctival sites ($p < 0.07$), both for the non-lens wearers and the previous CL wearers.

The CL wear group had significantly lower bulbar and tarsal conjunctival thresholds than the non-wearer group (inferior conjunctiva, CL 78.0 ± 31.8 mL/min vs non-wearers 127.2 ± 32.6 mL/min, $p = 0.001$; tarsal conjunctiva,

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96.7 ± 23.6 vs 120.5 ± 56.4 mL/min, $p = 0.099$). Inferior corneal threshold was also significantly lower in the previous CL wearers (63.4 ± 31.9 vs 91.0 ± 32.4 mL/min, $p = 0.08$), but there was no difference in central corneal thresholds (56.5 ± 26.4 vs 63.0 ± 26.0 mL/min, $p = 0.44$).

Discussion

This exploratory study is the first report of tarsal conjunctival sensitivity in contact lens wearers. This study has shown that tarsal conjunctival sensitivity is of a similar magnitude to inferior bulbar conjunctival sensitivity, and is lower than corneal sensitivity. Individuals who had reported discontinuation from contact lens wear due to discomfort demonstrated elevated conjunctival sensitivity (reduced sensation thresholds) compared with a matched group of non-lens wearers.

We found the sensitivity of the superior tarsal conjunctiva and the inferior bulbar conjunctiva to be significantly lower than the central and inferior cornea in both lens wearers and previous lens wearers. This is consistent with previous reports for bulbar conjunctival sensitivity.[2,6,7] Sensitivity of the upper tarsal conjunctiva has not previously been reported with a non-contact aesthesiometer.

Sensitivity at both conjunctival sites was increased in people who discontinued contact lens wear due to discomfort, whereas central corneal sensitivity was unchanged. These findings are in line with previous reports of increased bulbar conjunctival sensitivity in short-term contact lens wear.[2,3] In contrast, a study of long term successful wearers did not show alteration in bulbar conjunctival sensitivity.[5] This supports the idea that there are physiological differences between intolerant contact lens wearers, those who are successful, and non-wearers. We have demonstrated a technique that may distinguish between successful and unsuccessful contact lens wearers, based on their conjunctival sensitivity. It is important to understand whether altered sensitivity is a cause or a result of discomfort; future studies should be directed towards understanding the timecourse of this response and potential recovery.

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