



ORIGINAL ARTICLE

The measurement of intraocular pressure over positive soft contact lenses by rebound tonometry



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KEYWORDS

Contact lens;
Hydrogel;
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Abstract

Purpose: To investigate if the accuracy of intraocular pressure (IOP) measurements using rebound tonometry over disposable hydrogel (etafilcon A) contact lenses (CL) is affected by the positive power of the CLs.

Methods: The experimental group comprised 26 subjects, (8 male, 18 female). IOP measurements were undertaken on the subjects' right eyes in random order using a Rebound Tonometer (ICare). The CLs had powers of +2.00 D and +6.00 D. Measurements were taken over each contact lens and also before and after the CLs had been worn.

Results: The IOP measure obtained with both CLs was significantly lower compared to the value without CLs (*t* test; $p < 0.001$) but no significant difference was found between the two powers of CLs.

Conclusions: Rebound tonometry over positive hydrogel CLs leads to a certain degree of IOP underestimation. This result did not change for the two positive lenses used in the experiment, despite their large difference in power and therefore in lens thickness. Optometrists should bear this in mind when measuring IOP with the rebound tonometer over plus power contact lenses.

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PALABRAS CLAVE

Lentes de contacto;
Hidrogel;
Tonometría de rebote;
Presión intraocular

Medición de la presión intraocular sobre lentes de contacto blandas positivas, mediante tonometría de rebote

Resumen

Objetivo: Investigar si la precisión de las mediciones de la presión intraocular (PIO), utilizando la tonometría de rebote sobre las lentes de contacto (LC) desechables de hidrogel (etafilcon A), se ve afectada por la potencia positiva de dichas lentes.

Métodos: El grupo experimental incluyó a 26 sujetos, (8 varones, 18 mujeres). Se realizó la medición de la PIO en los ojos derechos de los sujetos, de modo aleatorio, utilizando un Tonómetro de Rebote (ICare). Las LC tenían potencias de +2,00 D y +6,00 D. Se realizaron mediciones con cada lente de contacto, y también antes y después a su uso.

Resultados: El valor de la PIO obtenido con ambas LC fue considerablemente menor al valor sin LC (t del test; $p < 0,001$), aunque no se halló una diferencia significativa entre las dos potencias de las lentes.

Conclusiones: La tonometría de rebote sobre las LC positivas de hidrogel origina un cierto grado de subestimación del PIO. Este resultado no sufrió variación entre las dos lentes positivas utilizadas en el experimento, a pesar de la gran diferencia de potencia, y por tanto del espesor de las lentes. Los optometristas deberían de tener en cuenta estos resultados en a la hora de medir el PIO con un tonómetro de rebote, con lentes de contacto de mayor potencia.

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Introduction

Primary open angle glaucoma is a potentially blinding condition.¹ Raised intraocular pressure (IOP) is an important risk factor for the development and progression of optic nerve damage in glaucoma, and is the target of both medical and surgical treatment being currently the only treatable risk factor.²

Measuring IOP over a soft contact lens (CL) can be very useful for several reasons. These include avoiding topical anaesthesia, minimizing trauma in conditions of corneal pathology, whenever there is a need to undertake tonometry several times, when the corneal surface is extremely irregular and finally to allow IOP measurement without removing the CLs.³

Villani⁴ was probably the first to use a soft contact lens with contact tonometry having the aim of avoiding pharmacological anaesthesia. Several studies showed that measurement of IOP can be performed over soft contact lenses using the Goldmann tonometer,⁵⁻¹² the Mackay Marg tonometer,¹³ the Tono-Pen,¹⁴⁻¹⁷ the gas pneumotonometer,^{16,17} the non-contact tonometer¹⁸⁻²⁶ and the dynamic contour tonometer.^{11,27-29}

In 2005 a new handheld device became available to measure IOP, the ICare rebound tonometer, having the advantage over other instruments that no topical anaesthesia is required. A light magnetized small, disposable probe, characterized by a round plastic tip, is launched towards the eye using a solenoid. The probe hits the eye and bounces back. The return rate of the probe after it touches the cornea permits information about IOP.³⁰⁻³¹ The results are reproducible and reasonably accurate.³²⁻³³ Several investigators³⁴⁻⁴⁰ have evaluated the ICare tonometer compared with other tonometry devices, showing a

reasonable overall correlation and concordance between the IOP obtained with the Goldmann or Pascal types.

It has been shown that with the rebound tonometer it is possible to measure IOP over soft CLs, either hydrogel or silicone hydrogel, with good clinical accuracy.³⁹⁻⁴⁰ However it has been found that the type of material and the power of the CL can cause an underestimation of IOP⁴¹ or overestimation.^{25,42}

The aim of this study was to verify this effect not only for a +2.00 D CL but also for a higher positive +6.00 D CL. Other corneal parameters such as thickness and curvature were evaluated to investigate their influence on the measurement.

Methods**Subjects**

Twenty-six subjects (8 male and 18 female), age range from 21.2 to 48.7 years (mean 28.8; SD 8.9 years), were enrolled in the study. Inclusion criteria were normal corneas (no corneal scarring, corneal pathology or prior corneal surgery), assessed by slit lamp examination and videokeratometry, and corneal astigmatism of not more than 2.50 D. Contact lens wearers were enrolled only if they had taken their lenses out for 12 h before the experiment. All subjects had been informed about the experiment in detail and had signed the consent document in compliance with the Declaration of Helsinki before the experiment.

Materials

All tonometric measurements were carried out with a rebound tonometer (ICare; Finland Oy). The CLs used were

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