



AN OBSERVATIONAL STUDY TO FIND OUT THE DIFFERENCE IN INTRAOCULAR PRESSURE VALUE OVER SILICONE HYDROGEL CONTACT LENSES BY USING NON-CONTACT AND REBOUND TONOMETRY

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ABSTRACT

The aim of this study was to find out the difference in intraocular pressure value over silicone hydrogel contact lenses by non-contact and rebound tonometry. This study included 60 eyes of 30 patients who did not have any ocular or systemic diseases or contraindications to contact lens use. We measured and recorded the IOP values of each patient without and with Silicon hydrogel contact lenses using Non Contact Tonometer and Rebound Tonometer. We compared the mean values and standard deviation of the measurements in each case using the independent t-test. The mean IOP value found with Non Contact Tonometry was 15.90 ± 2.57 mmHg without contact lens and with Contact lens was 15.73 ± 2.50 mmHg. It is found that the p-value 0.8354 which is > 0.05 , thus the difference found is statistically insignificant when measuring IOP without and with contact lenses by Non Contact Tonometry. The mean IOP value found with Rebound Tonometry was 16.00 ± 3.05 mmHg without contact lens wear and with Contact lens was 16.02 ± 2.89 mmHg. It is found that the p-value 0.6858 which is > 0.05 , thus the difference found is statistically insignificant when measuring IOP without and with contact lenses by Rebound Tonometry. Silicone hydrogel soft contact lens does not significantly affect IOP values measured with NCT and Rebound tonometry, and thus Rebound tonometry and non-contact tonometry can be reliably performed over silicone hydrogel CLs.

KEY WORDS: Intraocular pressure, silicone hydrogel contact lens, rebound tonometry, Non contact tonometry

INTRODUCTION

Nowadays, contact lenses are used for many reasons including beauty, removing any discomfort caused by glasses, vision improvement especially for patients with high Ameteropia, high astigmatism, keratoconus, corneal trauma and deformity as well as poor results of refractive surgery. Soft contact lenses are used for cosmetic, therapeutic and diagnostic purposes besides the correction of refractive errors. In addition to their optical indications, soft contact lenses are an effective treatment method for persistent

epithelial defects, recurrent corneal erosions, filamentous keratitis, corneal surface irregularities, corneal abrasions, corneal thinning, bullous keratopathy, thermal and chemical burns, and after refractive surgery and ocular surface reconstruction¹. The frequent removal of contact lenses used for therapeutic purposes in types of corneal diseases affects epithelization and the recovery process negatively¹. In cases where contact lens removal is not desired, frequent measurement of intraocular pressure (IOP) may be needed. In these patients, obtaining accurate



IOP values on contact lenses is significant in terms of follow-up and treatment of the patient².

Measurement of intraocular pressure (IOP) over therapeutic silicone hydrogel soft contact lenses using a non-contact and rebound method of tonometry could be applied in ophthalmologic practice, particularly in patients with corneal decompensation and subsequent bullous keratopathy, post-surgical sutures or exposed suture knots other important indications with corneal pain, and for facilitating healing. The detecting of increased IOP and treatment may help reduce the incidence and prevalence of glaucoma in these patients. The therapeutic silicone hydrogel contact lenses also may aid in sealing leaky wounds after cataract, penetrating keratoplasty or glaucoma filtering surgery. Thus, accurately measuring IOP independently from various corneal factors is gradually gaining importance. The aim of this study was to see the effect of silicone hydrogel soft contact lenses on IOP measurement by Non-Contact Tonometry and Rebound Tonometry.

MATERIAL & METHODOLOGY

This was a prospective, observational study done within a period of 1 year August 2018 to July 2019, in 60 eyes of 30 patients at K.P. Sanghvi Eye Hospital, Surat.

First, we took the IOP measurements of naked eyes with Non-Contact Tonometer (Nidek NT 510) and then with Rebound Tonometer (Icare). Then, we performed the same measurements 30 min after the insertion of SiHy contact lenses. The IOP values of the naked eyes and post lens insertion were measured with Non Contact Tonometer and Rebound Tonometer respectively.

Measurements with NCT were performed three times, and the average value was recorded. Again, if

the difference between the measurements was more than 3 mmHg, the extreme number was discarded, and another measurement was performed.

IOP measurement with Rebound Tonometer was taken after instructing the patient to relax and look straight ahead at a specific point to keep the eye steady, IOP measurements were recorded at a distance of 4–8 mm from the center of the cornea along the central corneal axis, and the long probe was kept in a horizontal position to the corneal center. After six consecutive measurements, the result is given with a letter P on the display followed by the IOP.

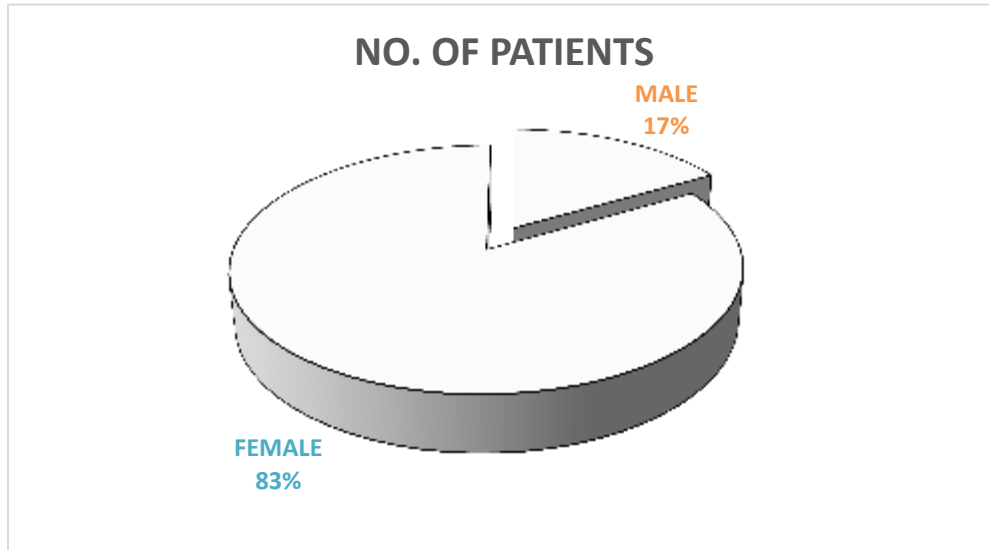
To avoid diagnostic error, all of the examinations were performed in the same timing during the day for each successive IOP measurement with and without contact lens and under same physical condition. Assessments were made in a room controlled for enlightenment, temperature, humidity, and airflow, to avoid ocular surface stress.

The physical/optical properties of the silicone hydrogel contact lenses used are Comfilcon A with Base Curve of 8.6mm, Total Diameter of 14mm, Center thickness of 0.08 mm, Lens Power : -0.50 D, Refractive Index: 1.40, Water Content : 48%, Specific Gravity : 1.04g/cm³, Modulus : 0.75 MPa, Oxygen Transmission Dk/t: 160 x 10⁻⁹(cm/sec)(ml O₂/ml x mmHg), Oxygen Permeability: 128 x 10⁻¹¹(cm²/sec)(ml O₂/ml x mmHg) 35°C (Coulometric method).

RESULTS

In our study out of 30 patients, 05 (16.66%) males and 25 (83.33%) females subjects, the female ratio was higher than male.

GRAPH 1- Pie Chart Showing the Gender Distribution



Also, the mean IOP value of Non-contact Tonometry without contact lens is 15.90 mmHg while with contact lens the mean value is 15.74 mmHg, which is slightly lower. The mean IOP value of rebound Tonometry without contact lens is 16.00 mmHg while with contact lens the mean value is 16.02 mmHg which is slightly higher.

According to the statistical analysis performed with Independent t test for Non Contact Tonometry without and with contact lens results in p-value is 0.8354.

According to the statistical analysis performed with Independent t test for Rebound Tonometry without and with contact lens results in p-value is 0.6858.

TABLE 1- Mean IOP and standard Deviation with and without contact lens:

IOP measurements with and without contact lens			
Tonometry	Mean IOP±SD		P-value
	Without contact lens	with contact lens	
Non Contact Tonometry	15.90 ± 2.57	15.73 ± 2.50	0.8354
Rebound Tonometry	16.00 ± 3.05	16.02 ± 2.89	0.6858

In our study, it is found that the p-value 0.8354 which is > 0.05, thus the difference found is statistically insignificant when measuring IOP without and with contact lenses by Non Contact Tonometry. The mean IOP value found with Non Contact Tonometry was 15.90 + 2.57 without contact lens wear and with Contact lens was 15.73 + 2.50 which was slightly lesser. PG Firat, C Cankaya, S Doganay, M Cavdar, S Duman, E Ozsoy and B Koc³, found that The mean IOP value of group 1 (IOP measurement with NCT without contact lens) and group 2: (IOP measurement with NCT with contact lens) was 14.55±2.95 mm Hg and 13.92±2.58 mm Hg in group 2. They detected no statistically significant difference

between group 1 and group 2(P=0.4063). In another study Patel and Illahi⁴ evaluated the IOP values obtained while wearing CLs with various power range and concluded that NCT can be performed through a contact lens if the power is not greater than +3 D and lens center thickness is no more 0.30 mm, which correlate with our study.

Also, Takenaka J, Kuniyama E, Rimayanti U, Tanaka J, Kaneko M, Kiuchi Y⁵ found no significant differences in the IOP measurements obtained while wearing SCLs using Rebound tonometry. The Bland–Altman plots in their study also showed that the average IOP difference measured on Rebound tonometry was close to 0 for all SCL examinations.



Similarly in another study Zeri F, Calcatelli P, Donini B, Lupelli L, Zarrilli L, Swann PG6 concluded that Rebound tonometry can be reliably performed over silicone hydrogel CLs, which co-relates with our study.

CONCLUSION

In conclusion, according to the results of this study, the silicone hydrogel (comfilcon A) Contact Lens does not significantly affect IOP values measured using non-contact tonometry and Rebound tonometry and thus IOP measurement over the silicone hydrogel CL, using non-contact tonometry and Rebound tonometry is reliable.

AREA OF FURTHER RESEARCH

Our study had a small sample size, and the investigation was performed using only young healthy Indian subjects. For this reason, we were unable to assess the influence of age or ethnicity on IOP. In addition, we do not know whether the results apply to patients with glaucoma or corneal abnormalities, as we examined only normal eyes. Future studies including eyes with corneal pathologies, glaucoma and/or CL of high power and contact lens with different center thickness are needed to analyze the value of IOP measured with CL on. We measured the IOP of young subjects in order to exclude the effects of age on IOP differences. We hope to examine the findings for different Contact lens in the future.

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