# IS THERE A DIFFERENCE IN INTRAOCULAR PRESSURE MEASURED WITH A SOFT CONTACT LENS AND WITHOUT USING FLURASAFE™?

By

Joshua Michael Haney

This paper is submitted in partial fulfillment of the requirements for the degree of

Doctor of Optometry

Ferris State University
Michigan College of Optometry

May, 2006

**ABSTRACT:**

BACKGROUND: Our goal is to ascertain if it is possible to accurately attain intraocular pressure (IOP) readings over a contact lens while using a high molecular weight fluorescein. FluraSafe™, an eye drop that both stains and anesthetizes the eye was used. FluraSafe™ contains fluorexon disodium 0.35%, benoxinate HCI 0.4%. METHODS: We measured the IOP of 88 normal eyes using Goldman applanation tonometry. A soft contact lens was then placed on the eyes and repeat measurements were taken. IOP measurement using conventional Goldmann tonometry with FluraSafe™ and without contact lens wear was employed as the standard for comparison. The readings obtained for the contact lens were then compared to the baseline readings taken without a lens in place in order to assess the effect that the contact lens had on the accuracy of the IOP measurements. Pachymetry was performed on all eyes to find the correction factor for each eye's IOP reading. RESULTS: The soft contact lenses with FluraSafe™ permitted accurate IOP measurements in eyes. CONCLUSIONS: There is no statistically significant difference ($p=0.15$) between IOP measured in the right eye with the soft contact lens or without. We also found no statistically significant difference ($p=0.49$) between IOP measured in the left eye with the soft contact lens or without. Our results suggest that the proposed method is accurate and useful in determining IOP prior to soft contact lens fitting

TABLE OF CONTENTS

# IS THERE A DIFFERENCE IN INTRAOCULAR PRESSURE MEASURED WITH A SOFT CONTACT LENS AND WITHOUT USING FLURASAFE™?

Lotoczky, Josh OD, Haney, Josh OD

**Abstract:** Our goal is to ascertain if it is possible to accurately attain intraocular pressure (IOP) readings over a contact lens while using a high molecular weight fluorescein. FluraSafe™, an eye drop that both stains and anesthetizes the eye was used. FluraSafe™ contains fluorexon disodium 0.35%, benoxinate HCI 0.4%. METHODS: We measured the IOP of 88 normal eyes using Goldman applanation tonometry. A soft contact lens was then placed on the eyes and repeat measurements were taken. IOP measurement using conventional Goldmann tonometry with FluraSafe™ and without contact lens wear was employed as the standard for comparison. The readings obtained for the contact lens were then compared to the baseline readings taken without a lens in place in order to assess the effect that the contact lens had on the accuracy of the IOP measurements. Pachymetry was performed on all eyes to find the correction factor for each eye's IOP reading. RESULTS: The soft contact lenses with FluraSafe™ permitted accurate IOP measurements in eyes. CONCLUSIONS: There is no statistically significant difference ($p=0.15$) between IOP measured in the right eye with the soft contact lens or without. We also found no statistically significant difference ($p=0.49$) between IOP measured in the left eye with the soft contact lens or without. Our results suggest that the proposed method is accurate and useful in determining IOP prior to soft contact lens fitting

**Introduction:**

In this study 88 healthy eyes from 44 subjects were used to ascertain if it is possible to accurately attain intraocular pressure (IOP) readings over a contact lens while using a high molecular weight fluorescein. FluraSafe™, an eye drop that both stains and anesthetizes the eye was used. FluraSafe™ contains fluorexon disodium 0.35%, benoxinate HCI 0.4%.

**Methods:**

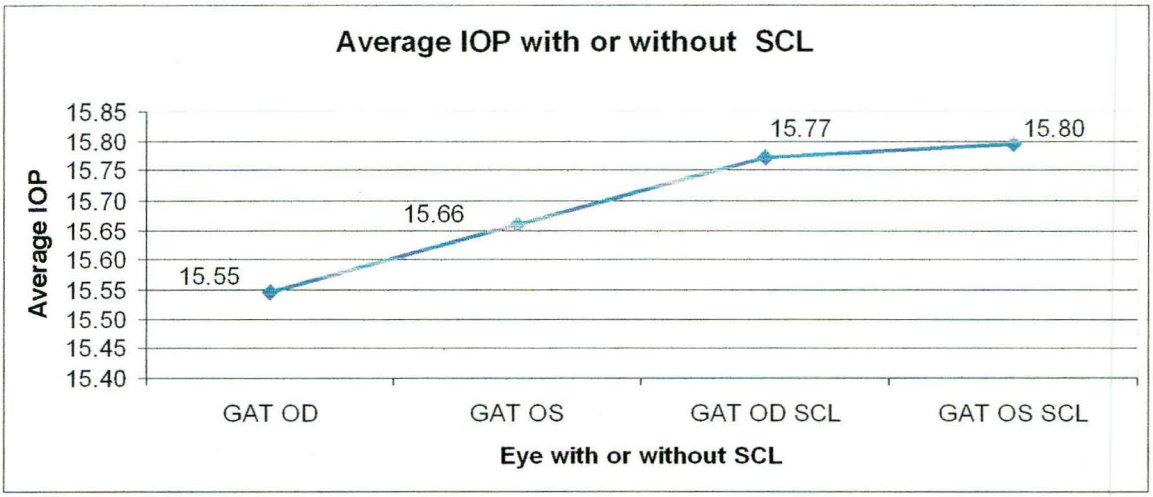
88 eyes of 44 healthy patients were included in this study. Six patients (12 eyes) involved in this study were daily soft contact lens patients and had to have their soft contact lenses removed before testing could be commence. None of the 88 eyes had any known ocular disease at the time of presentation. One patient (two eyes) was an overnight corneal reshaping rigid gas permeable lens wearer. Prior to commencing any testing each subject was evaluated via slit-lamp biomicroscopy to rule out any corneal pathology. After initial evaluation each patient received one drop in each eye of FluraSafe™ prior to Goldman applanation tonometry. Two measurements were then taken using Goldman applanation on each eye. To ensure that the measurements were accurate both measurements had to be within 1.0 mmHg. A CIBA focus daily lens (BC 8.6mm, Diam13.8mm, CT 0.128mm, Power +0.75D) was then placed on each eye. Slit lamp evaluation was then performed to make sure the contact lens fit adequately. Goldman applanation was then performed on each eye with the contact lens in place. Again, two measurements were taken on each eye to ensure accuracy. Upon completion of tonometry the lenses were evaluated with slit-lamp biomicroscopy for any residual staining of the contact lenses. Immediately after tonometry was performed with the

contact lens and slit-lamp evaluation was completed the contact was removed by the clinician and visually inspected under normal room light using fluorescent lights for any staining. After completion of visual inspection, central corneal thickness (CCT) was evaluated by corneal pachymetry on each eye. Five pachymetry readings were taken and then averaged to find the central corneal thickness.

**Results:**

The mean values for IOP measured without the contact lens were 15.55 mmHg in the right eye and 15.66 mmHg in the left eye. In comparison the mean value while wearing the contact lens was 15.77 mmHg in the right and 15.80 mmHg in the left eye. Central corneal thickness measurements were normal with a mean 545.65μm (range 470μm - 600μm). Pressures readings that were the same with the contact lens in place and without the contact lens accounted for 31 (35.23%) of the 88 eyes. 42 (47.73%) eyes in this study were within 1mmHg with the contact lens in place compared to no lens. Of the 42 eyes that were within 1mmHg 31 eyes recorded the IOP +1mmHg and 11 at -1mmHg. 12 (13.64%) eyes were within 2mmHg of the IOP recorded without a lens, of which nine were +2mmHg and three were -2mmHg. Only three (3.41%) eyes had IOP readings that differed by more than 2mmHg and each of them were -3mmHg from the IOP recorded without the contact lens. Overall, 73 eyes (82.95%) were 1 mmHg or less dissimilar with the soft contact lens in place compared to no contact lens. Using the paired-t test no statistical clinically significant difference was found between measurements taken with the Ciba Focus Dailies soft contact lens and without the lens in either eye. Also, no statistical significant difference was found when all IOP measurements from the eyes

without the soft contact lens were compared to the IOP measurements in the eyes with the contact lens in place.




**Discussions:**

Tonometry is one of the most important elements in an ophthalmologic clinical exam. Goldman applanation tonometry is the current gold standard to achieve accurate IOP readings. This poses a problem for practitioners when doing a contact lens exam. In the past clinicians would have to perform all preliminary testing with the contact lenses in the eye and then remove them to perform tonometry. Therefore, increasing chair time with the patients especially when optometric technicians are used to gather the initial information. Clinicians would then have to have the patient re-insert the lenses to asses the lenses for proper fit. Using the above mentioned method to achieve IOP readings can be easily taken with the contact lens on the patient without staining the contact lens. While studies have been done in the past using contact lenses without anesthetic or

fluorescein they tend underestimate IOP[1]. We have presented clinicians with a satisfactory method to save chair time and achieve accurate results. Although accurate results were obtained some problems exist with this technique. First, even though no residual stain was noticed with slit-lamp biomicroscopy minimal staining of the edges of these lenses did show upon visual inspection upon removal of the contact lenses. Second, there seemed to be more staining of the peri-ocular skin with FluraSafe than with Florox™, or other similar products. This observation was only from the clinicians past experience with the aforementioned products and no studies or controls were used in this study regarding peri-ocular staining. Third, on a few occasions while taking IOP reading with the lenses in place the mires were rather thick and somewhat difficult to assess. Finally, with the introduction of silicone-hydrogel lenses (SH) and the increase in the number of prescriptions for SH it would be wise to investigate the accuracy and degree of staining with these lenses.

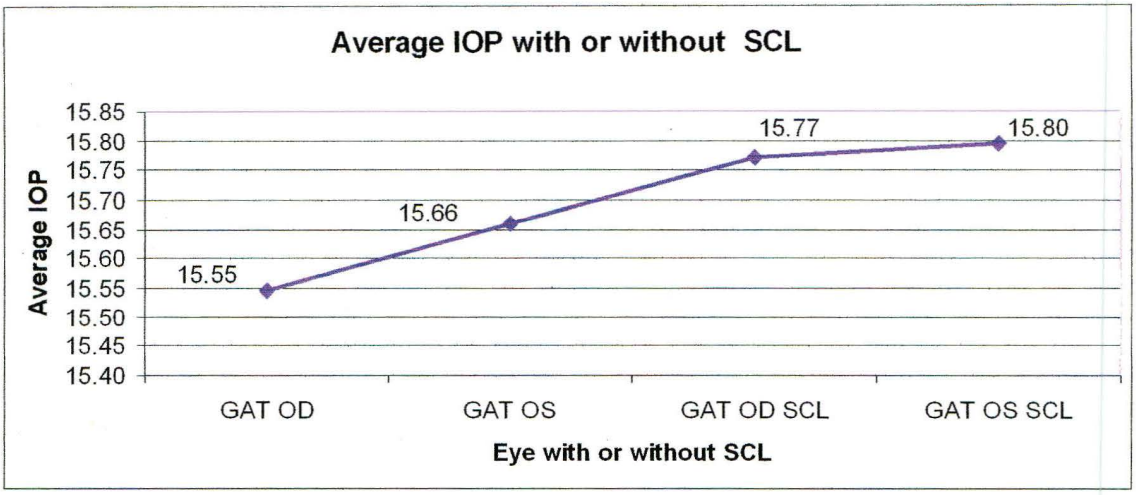
**Conclusions:**

There is no statistically significant difference ($p=0.15$) between IOP measured in the right eye with the soft contact lens or without. We also found no statistically significant difference ($p=0.49$) between IOP measured in the left eye with the soft contact lens or without. Our results suggest that the proposed method is accurate and useful in determining IOP prior to soft contact lens fitting. Therefore, using FluraSafe™ with patients that are wearing contact lens can save clinicians valuable chair time while still achieving accurate IOP measurements.

Bibliography

1. Lim L. Ng TP, Tan DT. Accurate Intraocular pressure measurement in contact lens wearers with normal pressures. CLAO 1997 Apr;23(2)130-3.
2. Au YK, Reynolds M. Goldmann tonometry and fluorescein solution: a way to avoid contact lens staining. CLAO J. 1991 Oct;17(4):256-7.
3. McMonnies CW. Noncontact tonometry through soft contact lenses. Am J Optom Physiol Opt. 1986 Dec;63(12):948-51.
4. Hitchings, Roger. Primary Glaucoma. In: Spalton, David, Hitchings, Roger, Hunter, Paul. London: Mosby; 2003. 7.2-7.26.

| patient | GAT OD | GAT OS | GAT OD S | GAT OS SCL |
|---|---|---|---|---|
| 1 | 12 | 13 | 14 | 14 |
| 2 | 14 | 14 | 13 | 11 |
| 3 | 12 | 10 | 10 | 10 |
| 4 | 14 | 14 | 14 | 14 |
| 5 | 14 | 14 | 14 | 15 |
| 6 | 14 | 16 | 15 | 17 |
| 7 | 13 | 18 | 13 | 15 |
| 8 | 15 | 15 | 15 | 13 |
| 9 | 15 | 15 | 15 | 16 |
| 10 | 16 | 16 | 16 | 16 |
| 11 | 17 | 18 | 17 | 17 |
| 12 | 17 | 17 | 16 | 16 |
| 13 | 20 | 19 | 20 | 20 |
| 14 | 20 | 19 | 21 | 22 |
| 15 | 21 | 21 | 19 | 19 |
| 16 | 15 | 16 | 16 | 16 |
| 17 | 22 | 22 | 24 | 24 |
| 18 | 14 | 11 | 12 | 8 |
| 19 | 10 | 9 | 11 | 10 |
| 20 | 14 | 14 | 13 | 14 |
| 21 | 18 | 19 | 19 | 20 |
| 22 | 12 | 10 | 12 | 11 |
| 23 | 13 | 13 | 13 | 12 |
| 24 | 12 | 13 | 14 | 14 |
| 25 | 14 | 14 | 15 | 15 |
| 26 | 11 | 11 | 12 | 12 |
| 27 | 20 | 20 | 22 | 22 |
| 28 | 13 | 14 | 13 | 15 |
| 29 | 22 | 22 | 22 | 23 |
| 30 | 14 | 14 | 14 | 15 |
| 31 | 15 | 16 | 16 | 17 |
| 32 | 18 | 19 | 18 | 19 |
| 33 | 12 | 12 | 13 | 12 |
| 34 | 18 | 17 | 19 | 17 |
| 35 | 10 | 10 | 11 | 10 |
| 36 | 13 | 14 | 13 | 13 |
| 37 | 17 | 18 | 17 | 18 |
| 38 | 13 | 15 | 14 | 15 |
| 39 | 19 | 18 | 20 | 18 |
| 40 | 23 | 22 | 24 | 23 |
| 41 | 15 | 15 | 14 | 15 |
| 42 | 16 | 16 | 15 | 16 |
| 43 | 17 | 17 | 16 | 16 |
| 44 | 20 | 19 | 20 | 20 |
| | 15.55 | 15.66 | 15.77 | 15.80 |


Average IOP with or without SCL
Average IOP
15.85
15.80
15.75
15.70
15.65
15.60
15.55
15.50
15.45
15.40
15.55
15.66
15.77
15.80
GAT OD
GAT OS
GAT OD SCL
GAT OS SCL
Eye with or without SCL

Tests of Within-Subjects Contrasts
Measure: MEASURE_1

| Source | factor1 | Type III Su | df | Mean Squa | F | Sig. |
|---|---|---|---|---|---|---|
| factor1 | Level 2 vs. Level 1 | 0.568182 | 1 | 0.568182 | 0.367773 | 0.547409 |
| | Level 3 vs. Level 1 | 2.272727 | 1 | 2.272727 | 2.137177 | 0.151037 |
| | Level 4 vs. Level 1 | 2.75 | 1 | 2.75 | 1 | 0.322905 |
| Error(factor1) | Level 2 vs. Level 1 | 66.43182 | 43 | 1.544926 | | |
| | Level 3 vs. Level 1 | 45.72727 | 43 | 1.063425 | | |
| | Level 4 vs. Level 1 | 118.25 | 43 | 2.75 | | |
| a | Computed using alpha = .05 | | | | | |

Tests of Within-Subjects Contrasts
Measure: MEASURE_1

| Source | factor1 | Type III Su | df | Mean Squa | F | Sig. |
|---|---|---|---|---|---|---|
| factor1 | Level 1 vs. Level 4 | 2.75 | 1 | 2.75 | 1 | 0.322905 |
| | Level 2 vs. Level 4 | 0.818182 | 1 | 0.818182 | 0.480745 | 0.491813 |
| | Level 3 vs. Level 4 | 0.022727 | 1 | 0.022727 | 0.015518 | 0.901444 |
| Error(factor1) | Level 1 vs. Level 4 | 118.25 | 43 | 2.75 | | |
| | Level 2 vs. Level 4 | 73.18182 | 43 | 1.701903 | | |
| | Level 3 vs. Level 4 | 62.97727 | 43 | 1.464588 | | |
| a | Computed using alpha = .05 | | | | | |