

# Comparative Evaluation of the Easyton Transpalpebral Tonometer and Tono-Pen XL Tonometer

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## INTRODUCTION

Traditionally, intraocular pressure (IOP) measurements have traditionally relied on corneal, applanation, and indentation procedures, despite there being many limitations with direct corneal measurements<sup>1,2</sup>. These can be eliminated with transpalpebral approaches to measurement of IOP, using devices like the Easyton Tonometer<sup>3</sup>.

Currently, there is limited published data regarding the Easyton and its measurement properties in comparison to well-established measurement procedures.

This study evaluates the accuracy and applicability of the Easyton as an alternative to the Tono-Pen XL Tonometer by comparing IOP measurements in a healthy, young adult population.

## OBJECTIVES

1. Describe the relationship and measurement properties between IOP values measured by the Easyton Tonometer and the Tono-Pen XL Tonometer.
2. Assess and evaluate the potential use of transpalpebral measurements as an alternative to direct corneal measurements.

## MATERIALS & METHODS

**Study design:** Balanced, two-factor, repeated measures, experimental research design. Factor one, EYE was fixed and contained two levels, right and left. Factor two, TONOMETER was fixed and contained two levels, Easyton and Tono-Pen XL.

**Procedures:** Healthy students enrolled in the Nova Southeastern University's Health Professions Division Programs were recruited for voluntary participation. IOP measurements were completed by trained researchers in an academic, clinical research setting. All measurements were completed in accordance with standard measurement procedures recommended by the tonometers' manufacturers. Five measurements were collected from each eye (R & L), with each of the two tonometers (Easyton & Tono-Pen XL), for each subject. The five measurements were averaged for each of the four research conditions and submitted to statistical analysis.

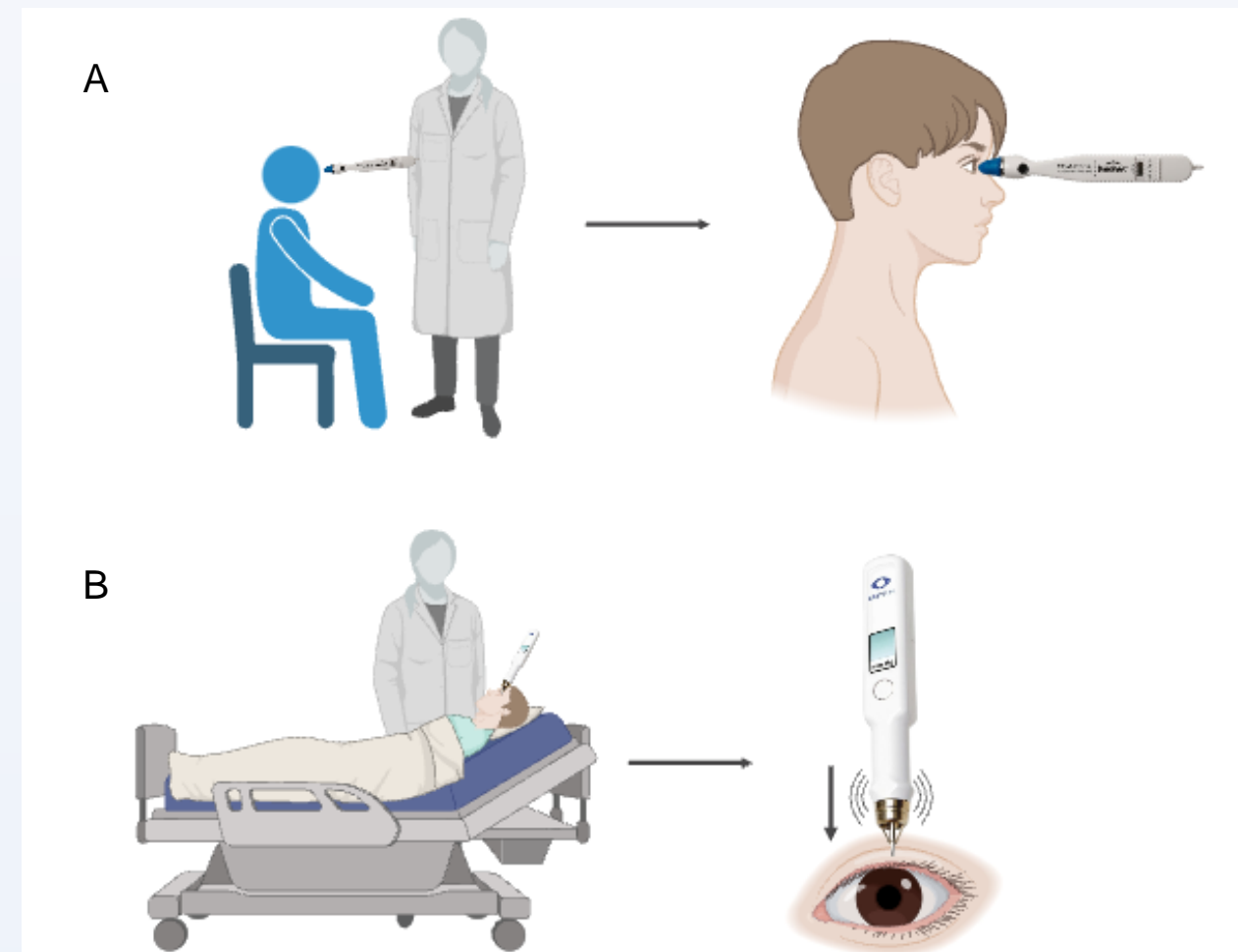


Figure 1: Schematic illustrating clinical IOP measurements, using the Tono-Pen XL (a) and Easyton tonometer (b). Created with BioRender.com

## RESULTS

**Subjects:** N=74, eyes=148. Age, mean years= 25.33 (SD 3.7).

**Main results:** Two-way ANOVA with repeated measures revealed no statistical difference between the right and left eyes ( $F(1, 295) = 0.12, p = 0.71$ ) or interaction between the eyes and tonometers, Easyton and GAT ( $F(1, 295) = 0.88, p = 0.34$ ).

**Main results (continued):** There was a significant difference between Easyton and Tono-Pen XL IOP measurements ( $F(1, 295) = 43.83, p < 0.001$ ). Easyton values (Mean 16.76 (SD 1.99) mm Hg) were slightly higher than Tono-Pen XL values (Mean 14.94 (SD 2.67) mm Hg).

The mean difference between Easyton and Tono-Pen XL values was 1.82 mmHg.

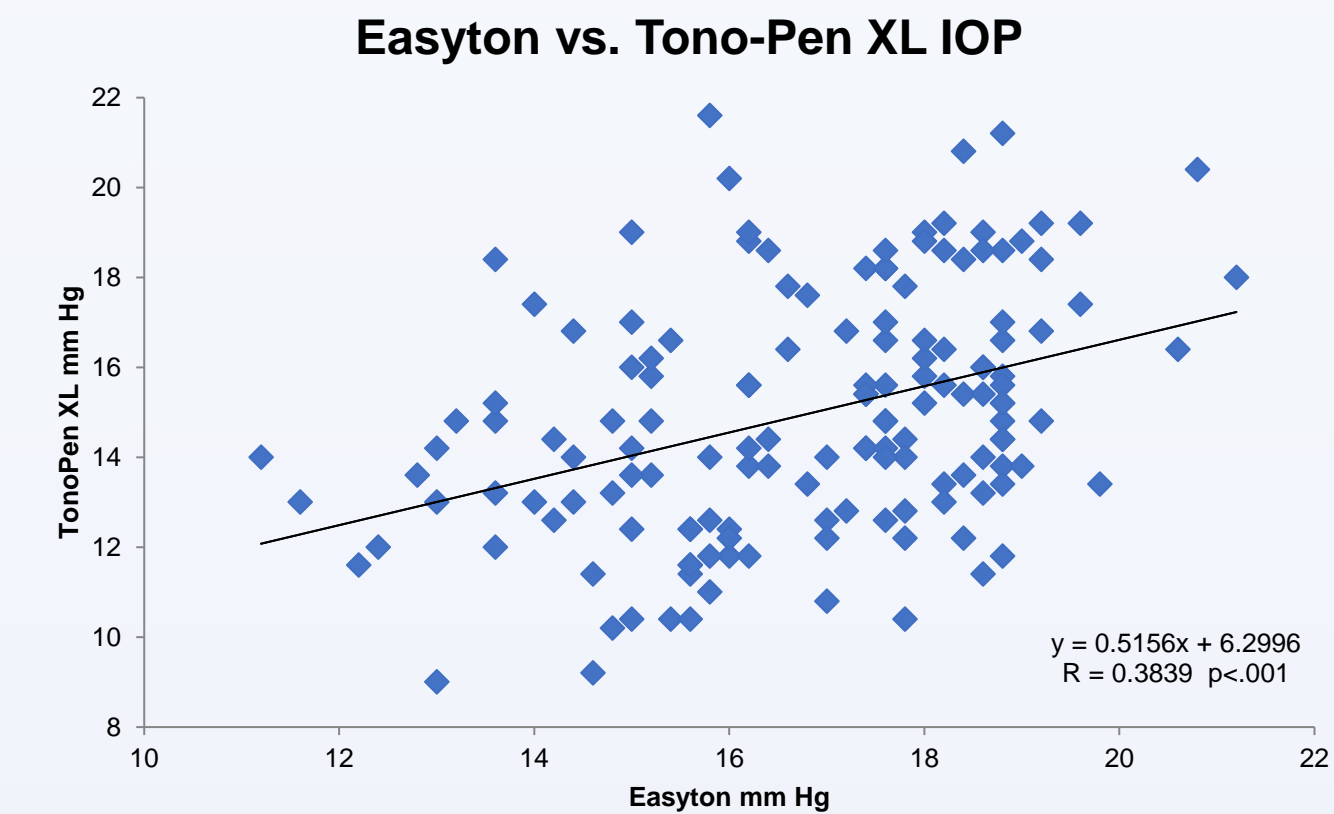


Figure 2: Scatter plot representing the relationship between IOP measurements taken by the Easyton tonometer and Tono-Pen XL Tonometer. Each point represents an averaged IOP measurement from one eye.

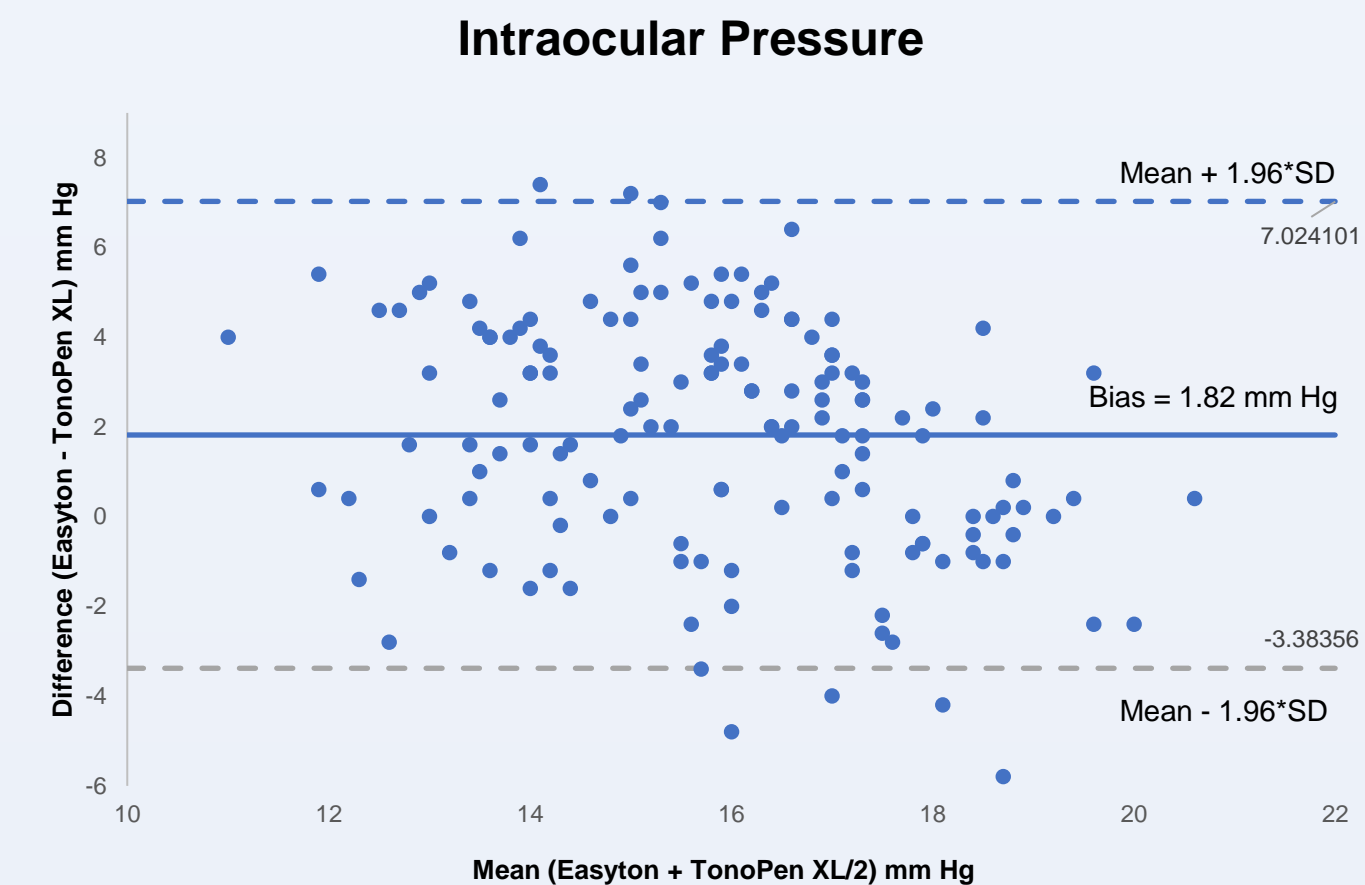


Figure 3: Bland-Altman plot of the IOP using the Easyton tonometer against Tono-Pen XL Tonometer. Each point represents an averaged IOP measurement from one eye. The solid line represents the mean difference (1.82 mmHg). The dotted lines represent the upper and lower 95% limits of agreement.

## CONCLUSIONS

Transpalpebral IOPs measured by the new Easyton tonometer were on average, statistically higher than the mean corneal IOP measured from the Tono-Pen XL. However, from a clinical perspective, the two instruments generate similar IOP values in a healthy, young adult population. This slight elevation in IOP measurement is consistent with other studies evaluating the accuracy of the Easyton tonometer <sup>6</sup>.

The Easyton transpalpebral tonometer generates IOP values similar to those measured by Tono-Pen XL and potentially could be used as an approximate substitute for Tono-Pen XL values, when direct corneal measurements can not be made or are medically contraindicated.

## ACKNOWLEDGEMENTS

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