

**ACCURACY OF VIDEOKEATOGRAPHERS FOR
MEASURING CORNEAL TORICITY**

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The use of simulated keratometer readings, as measured by computerized videokeratographers has become an increasingly popular trend in the fitting of contact lenses. Computerized videokeratographers are able to provide corneal curvature values (simulated K-readings) that are reported as being equivalent to those found with standard keratometry. Past studies have indicated that there are significant differences between keratometer readings and simulated K-readings. One study, for example, found that there could be as much as a 25% difference between measurements taken by a keratometer and those taken by a computerized videokeratographer. This difference has forced computerized videokeratographer manufactures to create new programs and software in an attempt to make simulated K-readings more equivalent to standard keratometry measurements. The purpose of our study was to determine the accuracy of the new EyeSys Corneal Analysis System (version 3.1) for measuring corneal toricity. The accuracy was determined by making a comparison between measurements taken from a Baush and Lomb keratometer to those taken by the EyeSys. The results of this study revealed that on average, the EyeSys topographer measured .23 D (15%) less corneal toricity than the keratometer.

The data for this study was obtained from measurements of 16 eyes, each of which contained at least 1.00 D of corneal toricity (measured by a keratometer). All eyes were examined and determined to be free of corneal degenerations, diseases and contact lens related problems. Care was taken to obtain good corneal maps and repeatable readings were obtained for both the EyeSys topographer and the keratometer. All measurements for this study were collected by one examiner and with the same keratometer and topographer to help reduce measurement error. The measurements were made using an

Bausch and Lomb keratometer and the EyeSys Corneal Analysis System version 3.1. The information from this study was then given to a separate examiner to perform the data analysis.

A comparison of the information from the two instruments revealed that corneal toricity measurements obtained by the EyeSys topographer were on average .23 D less (flatter) than those obtained from the B+L keratometer. This .23 D difference equals a 15% difference between the two measurements. (Table 1) It is interesting to note, however, that on average the power measured in a given meridian of the cornea was only found to be .007 D less (flatter) when measured by the EyeSys system. (Table 2) By grouping the corneal toricity measurements into two categories, it was found that as the corneal toricity increased, so did the difference between the two systems. For corneal toricity of 1.5 D or less the two systems differed by an average of .18 D, while corneal toricity greater than 1.5 D differed by an average of .37 D. (Table 3 &4)

Upon completion of the study it was found that clinically significant differences exist between corneal curvature measurements taken by a standard keratometer and those taken by a computerized videokeratographer. On average, the EyeSys system underestimated corneal toricity by .23 D (15%). This difference was found to increase or decrease, depending on the amount of corneal toricity being measured. It is therefore difficult to conclude that simulated K- readings are equivalent to standard keratometer readings because the correlation between the two systems has been found to decrease greatly as corneal toricity increases. We have concluded that there is no clinically significant differences between the two systems when measuring 1.5 D or less corneal

oricity, but that clinically significant differences occur when more than 1.5 D of corneal toricity exist.

Corneal Toricity Measurements

(Table 1)

	KERATOMETER	TORICITY DIFFERENCE	EYESYS
	1.50 D	-.15 D	1.65 D
	1.00 D	-.35 D	1.35 D
	1.50 D	+.15 D	1.35 D
	1.00 D	+.20 D	.80 D
	1.00 D	+.29 D	.71 D
	2.88 D	+.51 D	2.37 D
	3.00 D	+.58 D	2.42 D
	2.00 D	+.17 D	1.83 D
	2.13 D	+.21 D	1.92 D
	1.50 D	+.25 D	1.25 D
	1.25 D	+.29 D	.96 D
	1.00 D	+.38 D	.62 D
	1.00 D	+.21 D	.79 D
	1.00 D	+.11 D	.89 D
	1.50 D	+.65 D	.85 D
	1.38 D	+.19 D	1.19 D
AVERAGE	1.54 D		1.31 D

Power Measured in a given Meridian of the Cornea

(Table 2)

Standard Keratometer	EyeSys
43.00 D @ 180	42.93 D @ 001
44.50 D @ 090	44.58 D @ 091
43.00 D @ 180	42.59 D @ 159
44.00 D @ 090	44.60 D @ 069
43.00 D @ 160	42.99 D @ 152
44.50 D @ 070	44.34 D @ 062
43.00 D @ 007	43.26 D @ 009
44.00 D @ 097	44.06 D @ 099
47.00 D @ 176	46.94 D @ 020
46.00 D @ 086	46.23 D @ 110
44.12 D @ 170	44.70 D @ 160
47.00 D @ 080	47.07 D @ 070
44.50 D @ 020	44.58 D @ 180
47.50 D @ 110	47.00 D @ 090
41.00 D @ 003	41.05 D @ 005
43.00 D @ 093	42.88 D @ 095
40.87 D @ 174	40.90 D @ 168
43.00 D @ 084	42.82 D @ 078
43.50 D @ 170	43.15 D @ 156
45.00 D @ 080	44.40 D @ 066
43.75 D @ 015	43.21 D @ 013
45.00 D @ 115	44.17 D @ 103
43.00 D @ 180	43.38 D @ 151
44.00 D @ 090	44.00 D @ 061
43.12 D @ 015	43.38 D @ 013

44.12 D @ 105		44.17 D @ 103
42.50 D @ 012		42.77 D @ 001
43.50 D @ 102		43.66 D @ 091
44.75 D @ 180		45.00 D @ 179
46.25 D @ 090		45.85 D @ 089
44.12 D @ 180		44.11 D @ 177
45.50 D @ 090		45.30 D @ 087

Corneal Toricity of 1.00 D to 1.50 D

(Table 3)

Standard Keratometer		EyeSys
1.50 D		1.65 D
1.00 D		1.35 D
1.50 D		1.35 D
1.00 D		.80 D
1.00 D		.71 D
1.50 D		1.25 D
1.25 D		.96 D
1.00 D		.62 D
1.00 D		.79 D
1.00 D		.89 D
1.50 D		.85 D
1.38 D		1.19 D

Corneal Toricity Greater Than 1.50 D

(table 4)

Standard Keratometer		EyeSys
2.88 D		2.37 D
3.00 D		2.42 D
2.00 D		1.83 D
2.13 D		1.92 D

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