

Using the Pentacam for biometry after previous refractive surgery.

The *BESSt*© Formula: a significant improvement in accuracy.

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The determination of true corneal power after laser refractive surgery is inaccurate if manual keratometric values are used without further adjustment. This often leads to over-estimation of corneal power with an increased risk of hyperopic outcome after cataract surgery.

Purpose: We describe how to reduce the Standard Deviations (SD) and improve the accuracy of IOL power calculations after refractive surgery by using a new formula which requires measurements from the Oculus Pentacam™.

Methods: A new formula - *BESSt*© Formula - based on the Gaussian Optics Formula was developed at Moorfields Eye Hospital using data from 170 eyes which previously underwent keratorefractive surgery. The formula takes into account anterior and posterior corneal radius and pachymetry from the Pentacam™ and does not require any pre-keratorefractive surgery information. A software program was developed, the *BESSt*© Corneal Power Calculator, with which corneal power and IOL power required were calculated for a group of eyes which had previously undergone laser refractive surgery (for either myopia or hyperopia) and needed cataract surgery.

Results: In the operated eyes, the target refractions calculated with the *BESSt*© Formula were statistically significantly closer to the post-operative manifest refractions (mean deviation= 0.08 D \pm 0.62 SD) than those calculated with the following methods: History technique (-0.07 D \pm 1.92 SD; p=0.05); History technique with Double-K adjustment (0.13 D \pm 2.39 SD; p=0.05); Holladay 2 Formula with K-values estimated from the Contact Lens Method (-0.76 D \pm 1.36 SD; p=0.03); Holladay 2 Formula with K-values taken from the Atlas™ (Zeiss Meditec Inc) Topographer (-0.55 D \pm 0.61 SD; p<0.01). The SD of the mean absolute deviation was \pm 0.26 D with the *BESSt*© Formula and \pm 0.49 D with the Holladay 2 Formula with K-values from Atlas Topographer. Using the *BESSt*© Formula, 46% of the eyes were within \pm 0.50D of the intended refraction and 100% within \pm 1.00D.

Conclusions: The *BESSt*© Formula is statistically significantly more accurate than the other techniques and does not require any pre-refractive surgery information. We believe it represents a significant step forwards in the accuracy of IOL power calculation in eyes which previously underwent laser refractive surgery and especially when pre-refractive surgery data is unavailable.

For further information on *BESSt*© Formula, send email to: info@besstformula.com

Free software version available from: www.besstformula.com

STUDY RESULTS IN EYES UNDERGOING PHAKO AFTER KERATOREFRACTIVE SURGERY:

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Mean Deviations between Target Refractions calculated with various techniques and the Actual Post-phakoemulsification refractions in eyes which previously underwent keratorefractive surgery for myopia or hyperopia.

- *BESSt© Formula* (0.08 D ± 0.62 SD)
- *Clinical History Method* (-0.07 D ± 1.92 SD; p=0.05);
- *Clinical History Method with Double-K adjustment* (0.13 D ± 2.39 SD; p=0.05);
- *Holladay 2 Formula* using K-values from the *Hard Contact-Lens over-refraction Method* (-0.76 D ± 1.36 SD; p=0.03);
- *Holladay 2 Formula* using K-values from the *Atlas™ Topographer, Carl Zeiss Meditec Inc™* (-0.55 D ± 0.61 SD; p<0.01).

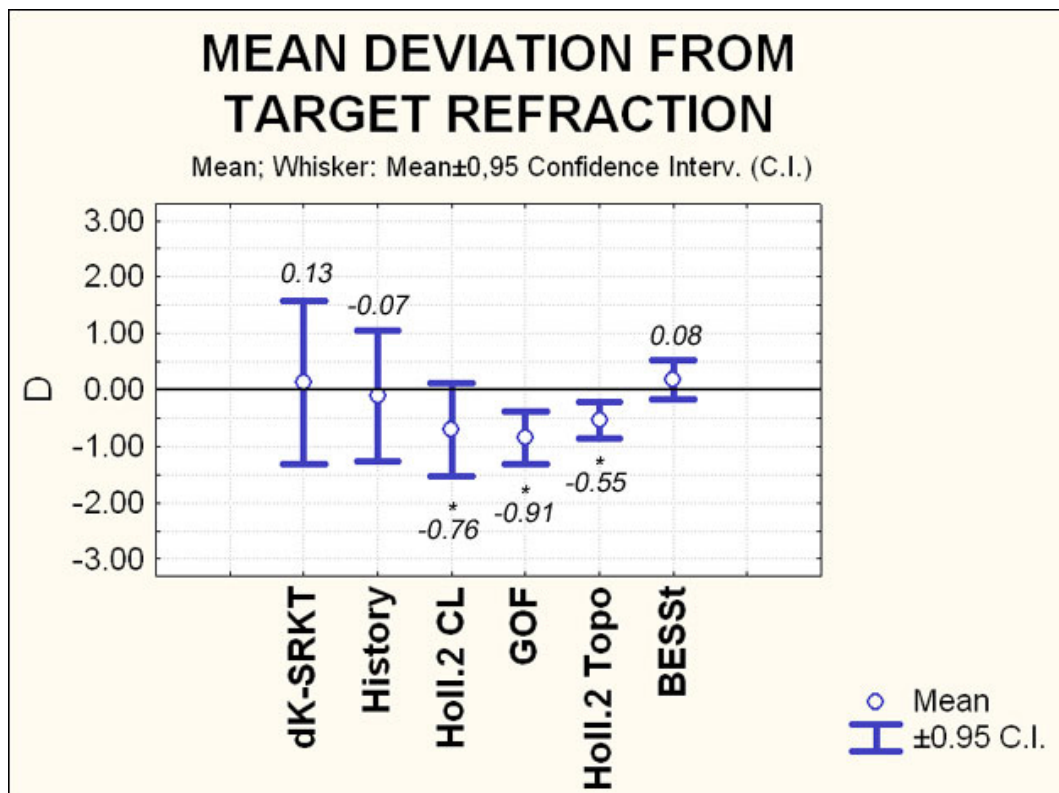


Figure 1. Mean Deviation. The zero line represents a perfect match between Target and Achieved post-phako refraction. The numbers represent the mean deviations. The *BESSt© Formula* provided the greatest accuracy compared to the other formulae analyzed.

Legend: *= statistically significant difference (p<0.05) between the current technique and the *BESSt© Formula*; Conf. Interv. (C.I.) =confidence interval; d-K SRKT= History technique with double-K SRK/T adjustment; History= History technique; Holl.2 CL =contact lens over-refraction technique using Holladay 2 formula; GOF=Gaussian optics formula; Holl.2 Topo = Holladay 2 formula using central K values provided by Atlas™ Corneal Topography (Carl Zeiss Meditec, Inc.).

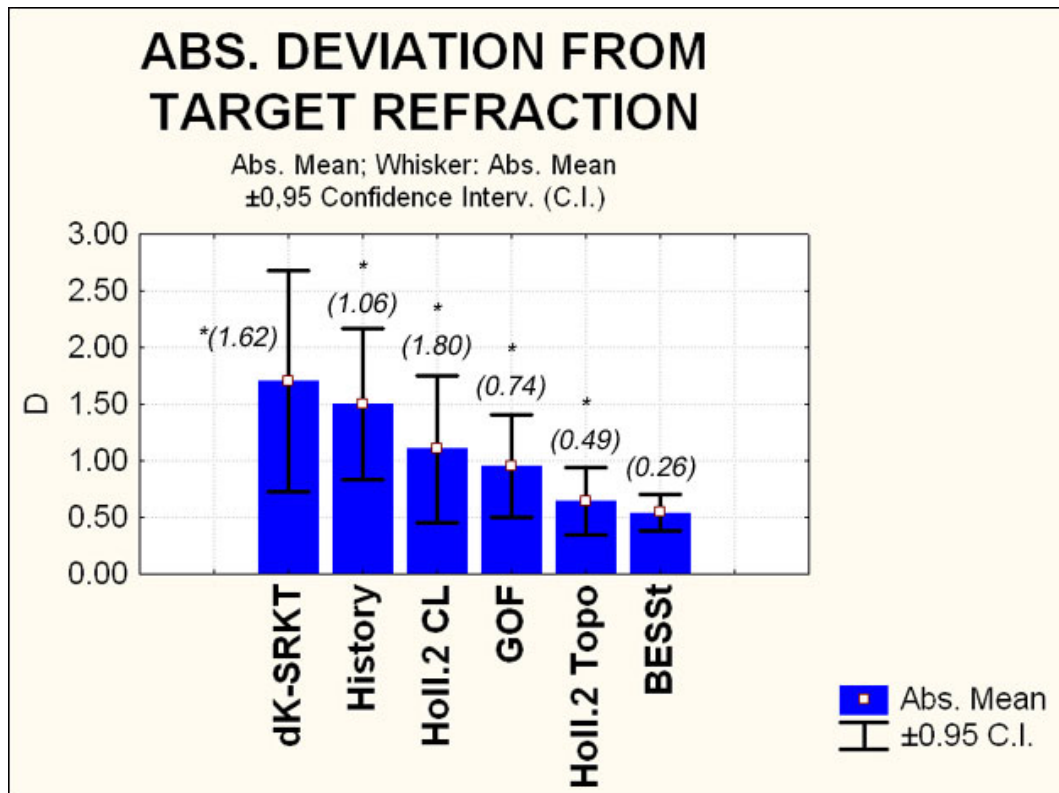


Figure 2. Mean Absolute Deviations. The Standard Deviations (SD) are reported in brackets. The *BESSt*® Formula provided the greatest accuracy, with an Absolute SD nearly as half as the one of the *Holladay 2* Formula with K-values from the Atlas topographer (±0.26 versus ±0.49 D SD, respectively).

Proportion of eyes within ±x D of the intended Target refraction after phako.

Mean Difference From Intended	BESSt®	History	d-K SRK®/T	Holladay 2® CL	Holladay 2® Atlas™
≤0.50 D	46.2 %	23.1 %	30.8 %	38.5 %	53.8 %
≤0.75 D	76.9 %	23.1 %	38.4 %	38.5 %	61.5 %
≤1.00 D	100 %	30.8 %	38.4 %	61.5 %	69.2 %
≤1.50 D	100 %	61.5 %	46.2 %	61.5 %	92.3 %
>1.50 D	0 %	38.5 %	53.8 %	38.5 %	7.7 %

In summary: The *BESSt*® Formula is statistically significantly more accurate than the above described techniques and it does not require any pre-refractive surgery information. In our practice it has significantly improved IOL power calculation accuracy and SD in post refractive surgery eyes. Its use is particularly valuable when pre-refractive surgery data is unavailable.