

# Comparison of topography-guided (TGL) to standard LASIK (SL) for hyperopia. How important is adjustment for angle kappa ?

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## INTRODUCTION

Refractive surgery has gained significant popularity in the last two decades by eliminating the need for spectacles or contact lenses. While the lasers and software that drives them become more sophisticated, there are still alignment errors during photoablation that could lead to decentration and nonhomogenous ablation patterns. Decentered ablations can lead to negative visual effects including irregular astigmatism, reduced best corrected visual acuity, glare etc.<sup>1,2</sup> Thus, proper centration of the ablation zone during refractive procedures is an essential goal. However, a large angle kappa, which is defined as the difference between the primary line of sight and the pupillary axis, may cause alignment errors during photoablation. This issue is more important in hyperopic patients that tend to have larger angle kappa.<sup>3</sup> Because of this, some refractive surgeons prefer to alter the location of the ablation to take into account a large angle kappa. However, there is little data in the literature concerning the normative values of angle kappa in healthy subjects.

There are various methods, which measure the amount of angle kappa. Synoptophore is one of the most widely used methods in the clinical practice. It measures angle kappa depending on the corneal reflection methods. Recently, newer devices such as Orbscan II (Orbtek Inc. Bausch&Lomb, Rochester, USA) have become commercially available and can be used in the evaluation of angle kappa. But, there is no published data evaluating the reliability of Orbscan in measuring angle kappa. We have previously reported our experience in hyperopic LASIK

Why study topo-guided hyperopic LASIK?

- 1-Compare to previous data from previous published standard treatments
- 2-Can we safely and effectively compensate for angle-kappa
- 3-The safety and efficacy of TGL Vs SL in hyperopia n

## METHODS

35 patients treated with Topo Guided LASIK in one eye, Standard LASIK in the other. The Wavelight and Intralase systems were used. Refraction, UCVA, BSCVA, angle kappa; effective ablation diameter (EAD), wavefront analysis (WA) and contrast sensitivity (CS) were evaluated with 18 months follow-up.

A video presentation of this technique is available in our website:  
[www.brilliantvision.com](http://www.brilliantvision.com)



These figures depict the same planned excimer profile for the correction of hyperopic astigmatism. On the left: centered on the pupillary center and on the right: adjusted by topography to take into consideration and adjust for angle kappa

## RESULTS

Mean values: pre: +3.08 Diopters (D) sphere, pre +0.80D cylinder. Mean post-values Topo-Guided LASIK compared tp Standard LASIK: UCVA: 20/65 to 20/23. Regression: + 0.32 to +0.55. Cylinder: + 0.25 to +0.54. EAD: 6.8 to 6.2 mm, Wavefront Analysis: 0.25 to 0.37.CS: +40% to + 15%.



The topo-guided eye on the left and standard on the right

## DISCUSSION

Angle kappa is determined by the intersection between the line of sight and the pupillary axis. Because the fovea lies slightly temporal to the point at which the pupillary axis intersects with the posterior pole of the globe, the normal angle kappa is slightly positive.<sup>3</sup> Evaluation of angle kappa before refractive surgery has gained significant importance because ablation zone centration during refractive surgery is a critical step. Uozato and Guyton<sup>4</sup> asserted that centering on the pupil is the proper method of centration because the photoreceptors are aimed toward the center of a normal pupil; their method has since become the standard practice. However, Pande and Hillman<sup>5</sup> stated that the optimal centration is the corneal intercept of the visual axis because this is the line joining the fovea to the fixation point. They have concluded that coaxially sighted corneal reflex was nearest the corneal intercept of the visual axis. Recently Nepomuceno et al.<sup>6</sup> performed hyperopic LASIK with the ablation centered on the coaxially sighted corneal light reflex. They have concluded that traditional centering method based on the entrance of the pupil could lead to decentration in the presence of a large angle kappa, especially in the hyperopic patients.

TGL and SL appear to be safe and effective for hyperopia. TGL appears to be superior in regard to regression, residual astigmatism, CS and EAD. Hyperopic LASIK utilizing the topography-guided Wavelight ALLEGRETTO eyeQ™ excimer laser appears to be safe and effective in the correction of low, moderate and high hyperopia and/or hyperopic astigmatism. The results appear to be safe and predictable for the low and moderate hyperopia groups; they appear to carry similar promise in the high hyperopia / high cylinder group. The topography guided platform appears to better center the ablation to the visual axis Vs the pupillary center with high level of reproducibility in all cases, and compared to our previously published results with standard hyperopic treatments with this laser.

We feel that correcting for angle kappa gives more accurate results and prohibits the induction of astigmatism a common occurrence with hyperopic corrections due to the "eccentric" placement of the ablation on the pupillary center and not on the visual axis.

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