41-Hyperopic LASIK: a comparison of the Nidek EC-5000, Chiron PlanoScan, and Kera Isobeam

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With all the interest these days in hyperopic LASIK (H-LASIK), it is only a matter of time before we want to know not only whether H-LASIK works, but which excimer laser works best in performing H-LASIK. For an answer to this question, American ophthalmologists, as is increasingly the case, are forced to look abroad, where medical research often may be performed with less regulation than in the U.S.

Roberto Zaldivar, MD, of Mendoza, Argentina, was the first author of this study which employed three lasers, the Nidek EC-5000, Chiron PlanoScan, and Kera Isobeam, to perform hyperopic LASIK (H-LASIK). Co-authors of this study were Jonathan M Davidorf, MD of West Hills, CA, and Susana Oscherow, MD, also of Mendoza, Argentina.

The authors assessed the H-LASIK ablation patterns in all three excimer lasers using photographic plates. In addition, the ablation profile on human study eyes were assessed for the Nidek EC-5000 and Chiron PlanoScan lasers.

It is important to note that, as Dr. Zaldivar himself pointed out, the three lasers were compared *sequentially*, rather than on a *simultaneous* basis. In other words, Dr. Zaldivar is reporting on his sequential experience with the three lasers. The study, therefore, was neither prospective nor randomized. This limitation prevented many generalizations from being made about the relative

advantages of the broad beam, scanning slit, and flying spot delivery systems that were used.

To date, Dr. Zaldivar has performed H-LASIK on 624 eyes--an impressive number. The great majority of these procedures (576 of 624) were done using the Chiron PlanoScan. An advantage of this scanning slit laser, in Dr. Zaldivar's opinion, is that it is possible to achieve a smoother ablation profile than with a broad beam. It also may be technically easier to treat hyperopic astigmatisms with this system than with the broad beam delivery systems.

Patients were divided into low (+1.0D - + 3.0D), moderate (+3.25 - + 5.0D), and "extreme" hyperopia groups (> +5.25D). Note the range of hyperopia in each of these divisions is significantly higher than in most other reported studies (e.g., many studies would classify > 3.25D of hyperopia as “high hyperopia”). Similarly, Dr. Zaldivar classifies “low toric” as less than 4.0D of astigmatism. The largest group of patients treated fell into the “low hyperopia-low toric” group.

All three laser systems were able to achieve smooth hyperopic ablations, as measured by photographic plates. No data was presented on whether any of the three lasers studies achieved significantly smoother ablations than the others. Over 80% of patients achieved postoperative spherical equivalent of between +0.50D and -1.00D, regardless of which laser was used. Patients both lost and gained best corrected visual acuity (BCVA). In Dr. Zaldivar's opinion, this gain in BCVA was somewhat surprising, since it could not be explained by the elimination of spectacle minification, which is the reason commonly given for BCVA following myopic LASIK.

There was an initial overcorrection, especially in the low hyperopia, low toric group, followed by regression to leave most patients only slightly undercorrected.

Analysis of patients with moderate degrees of hyperopia (+3.25 - + 5.0D) showed a larger spread of postoperative refraction than those patients in the low hyperopia group. This result demonstrated the poorer abilities of current nomograms to predict results in patients with greater degrees of hyperopia. Visual complications included halos, glare, and diplopia, especially in those cases of decentration. 2% of patients lost two or more lines of BCVA.

Overall, 11.9% of patients after H-LASIK required retreatment. This figure is slightly higher than for myopic LASIK, in Dr. Zaldivar's experience. The reason that regression is more common in hyperopic LASIK vs. myopic LASIK has to do with greater induced epithelial hyperplasia with H-LASIK.

In conclusion, according to Dr. Zaldivar and co-workers, all three of these lasers can achieve smooth ablations, and can be successfully used for hyperopic LASIK.

The paper was discussed by Dr. Michael C. Knorz, MD of Mannheim, Germany. For ease of re-analysis, Dr. Knorz divided all patients in the current study into those with and without any pre-existing astigmatism. He noted that Dr. Zaldivar had chosen to exclude all patients treated with the Kera Isobeam laser from the study because of several changes in the protocol in these patients.

Overall, predictability was lower in the toric group vs. the spherical group, and was lower in high vs. the low hyperopia groups, as might be expected. These results were consistent with the results of Dr. Knorz's own study.

Most worrisome, fully *two-thirds* (67%) of patients in the high hyperopia group (>5.25D) lost one or more lines of BCVA. Again, these data are supported by the patient satisfaction results in Dr. Knorz's own study, where fully 20% of patients with hyperopia greater than +5.0D were *dissatisfied* with their results.

Dr. Knorz summarizes that H-LASIK is safe and effective for low degrees of hyperopia. For moderate degrees of hyperopia, results are reasonably accurate, but some loss of BCVA occurs. For high hyperopia, H-LASIK is limited by both poor predictability and poor safety (as measured by loss of BCVA). Dr. Knorz suggests limiting H-LASIK to low and moderate hyperopia, with low to moderated degrees of associated astigmatism.