

# The Importance of HOA Reduction Measurements to Improving Refractive Surgery Result Outcomes [Letter]

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## Dear editor

For two-plus decades there has been a technological push by corporations and surgeons/researchers in a healthy pursuit to improve surgical outcomes. For refractive surgery, specifically laser vision correction, there has been no shortage of opinions and theories on the science and protocols to not only improve accuracy of outcomes, but also increase quantity and quality of vision. Existing laser vision treatments are an excellent equivalent to spectacles and lenses, but to re-energize the refractive surgery market there are two needs: (1) increasing quality for clearer, sharper vision by reducing higher order aberrations (HOA) making refractive surgery more than an equivalent; and (2) the ability to prevent and treat surgically induced visual aberrations that have created fear of refractive surgery in prospective patients.

This requires not only accurate lower order astigmatism calculation, but also science that explains how treatment affects the light path, and the development of a coherent set of protocols that apply to the treatment of all eyes, from primary treatments to highly aberrated eyes damaged by disease, trauma, or surgery.

We know it is possible to have 20/15 vision with subjective visual aberrations, but in my experience patients prefer 20/20 vision with minimal aberrations to aberrant 20/15 vision. Quantity and quality of vision are related, but a treatment that improves quantity may not always improve quality. Reducing the scatter of light that causes subjective visual aberrations via HOA reduction is necessary to improve visual quality.

It is a positive step that Dr Kanellopoulos et al<sup>1</sup> include HOA reduction data, but a confusing scenario is created with the dichotomy of excellent post-operative visual results but increased average HOA. Vision quantity results have difficult to control variables, demographics, magnitude of correction, as well as measurement methodology. A cohort of young patients will have better Snellen visual measurements than an older cohort or a cohort with high average magnitude of correction, and so forth. Vision quality is more objectively measurable via the reduction of HOA.

There is also the question of which HOA should be utilized. Current technology provides a choice of two – corneal HOA (topography) or whole eye HOA (wavefront). Innoveyes utilizes an evolution of wavefront imaging measuring whole eye aberrations including transient vitreous changes and lens changes in older patients. Corneal HOA is arguably a more stable standard, as corneal stromal HOA are more stable, can be mapped with higher resolution, and epithelial compensation can be accounted for. While I favor reduction of corneal HOA and creation of a more uniform cornea as the superior pathway due to factors such as stability, perfecting the anterior focusing element of a system, and the high resolution of Placido topography corneal HOA maps, I believe that measurement of HOA is critical to a cohesive search for improved ophthalmic surgical outcomes. Once HOA reduction is taken into account, it also facilitates treatment of damaged corneas caused by disease, past surgery, or trauma.

I urge my colleagues in research, clinical practice, and the corporate world to include measurement of HOA reduction as a critical barometer of improving surgical outcomes.

## Disclosure

Dr Manoj Motwani reports a patent issued for utilizing topographic guided ablation to make uniform cornea. The author reports no other conflicts of interest in this communication.

## Reference

1. Kanellopoulos AJ, Maus M, Bala C, Hamilton C, Lemonis S, Jockovich ME. International multicenter, myopic and myopic astigmatism femto LASIK, customized by automated ray-tracing ablation profile calculation: a postmarket study. *Khoram R Clin Ophthalmol.* 2024;18:525–536. doi:10.2147/OPTH.S435581

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