True 3-Dimensional Tracking at Ultra High Speeds for Custom Surgery.

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Purpose: To describe the outcomes of the first cases treated for irregular astigmatism with the CustomVis all-solid-state scanning technology.

Methods: Solid state, superfast scanning and eye tracking with the CustomVis system was applied to three cases, two with post PK and one with post PRK irregular corneas were treated, which required high levels of closed loop scanning accuracy >1kHz, and adjustments for cyclorotation, gaze tracking, and eye movements.

Results: Superfast scanning and tracking delivered the following results. Patient 1 s/p PK demonstrated an improvement of BSCVA from 20/30 to 20/20, a 7 line improvement in UCVA and a >3D decrease in K cylinder. Patient 2 s/p PRK and CRI's also had a BSCVA improvement from 20/30 to 20/20, a 4 line improvement in UCVA and a > 3D decreased in K cylinder. Patient 3 s/p PK demonstrated 6 line improvement in UCVA a 12D refractive change in one meridian, 5.25D refractive change in the opposite meridian and an 8D decrease in K cylinder associated with no loss of BSCVA (20/40).

Conclusion: Technical issues for custom surgery such as closed loop response of the sense-adjust-aim-fire scanning process, superfast tracking of the limbus of the un-dilated eye, and intra-operative adjustments for gaze and cyclorotation movements are critical to custom surgery success.