



## Management of Highly Aberrated Corneas After Keratorefractive Surgery

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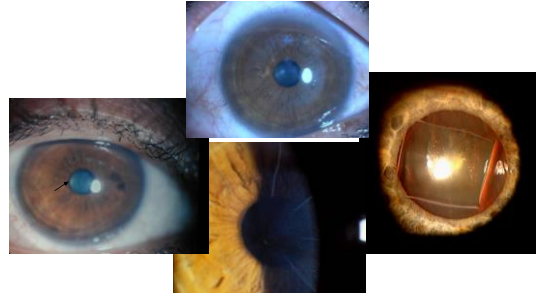


Treatment of refractive error in patients with complex corneas using iDesign  
 ESCRS 2013, Amsterdam

Dr. Mohamed Shafik  
 Horus Vision Correction Center (HVCC)  
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Management of an irregular cornea and unsatisfied patients after previous keratorefractive procedures has been always a real challenge in our daily practice.



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Various Topo-guided/Corneal WF-guided ablation pattern could be used in spite of their insufficiency!

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A Topo-guided ablation profile:

- Uses the elevation topography to create an essential surgical plan to regularize the corneal surface

**This is a crude concept of the Cause / Effect relation!**

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Weaknesses of Topo-guided procedures:

- Surgical plan is generally subjective and individual
- Difficult to predict the precise spherical or Cylindrical component that will be corrected/remaining
- Potential for a hyperopic shift (excess central ablation)
- Possibility to increase (rather than decrease) the irregularity if the exact corneal elevation is not treated.
- Inadvertent localized ablation of the steepest area as opposed to the most elevated area can compromise vision rather than improve vision by increase the slope of elevation.

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WF-guided ablation Profile

- Provides a more constant measure of the Cause / Effect relationship
- This can enables the surgeon to develop an ablation nomogram for irregular customization

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## WFG Laser Vision Correction using the iDesign System

- High-resolution sensor maximizes capture rates
  - High-resolution Hartmann-Shack wavefront sensor (5 times higher than *WaveScan*)
  - Fourier reconstruction algorithms using up to 1257 micro-refractions over a 7 mm diameter wavefront
  - Outstanding accuracy, and ability to measure complex wavefronts or highly aberrated eyes for treatment planning
- Increasing resolution provides
  - Ability to capture more patients
  - Improved spot quality, reduces spot cross over effect
  - Detection of HOAs
  - Better reconstruction



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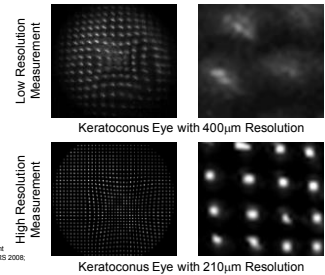
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## High-Definition Hartman-Shack Sensor



### WaveScan vs. iDesign system comparison

- Improved spot quality
- Better detection of highly aberrated eyes<sup>1</sup>
- For example: keratoconus, post incisional refractive procedures, irregular ablation profiles



<sup>1</sup> Neal D.R., Baer C.D., Costard J. et al. Combined wavefront aberrometer and new advanced corneal topographer. ASCRS 2008, MF302

2012.05.04 RFS224 (OUR Version)

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## The Time-Honored WF Ablation!! JRS-December 2013

ORIGINAL ARTICLE

### Four-Year Visual, Refractive, and Contrast Sensitivity Outcomes After Wavefront-Guided Myopic LASIK Using an Advanced Excimer Laser Platform

Mohamed Shafik Shaheen, MD, PhD; Tamer Hamdy Massoud, MD, PhD; Hani Ezzeldin, MD; Mounir Ahmed Khalifa, MD, PhD

**ABSTRACT**

**PURPOSE:** To evaluate the 4-year visual, refractive, and contrast sensitivity outcomes of wavefront-guided LASIK for the correction of low to moderate myopia using the VISX CustomVue technology (Abbott Medical Optics, Inc., Santa Ana, Calif.).

**W**avefront-guided ablations have been effective in minimizing aberrations in eyes without previous corneal refractive surgery, providing an excellent postoperative visual acuity.<sup>1-4</sup> Aberrometric corrections can be compromised significantly if the centration of the procedure is not extremely precise. Baasler et al.<sup>5</sup> reported that a lateral alignment accuracy of 0.07 mm or less

**CONCLUSION:** Wavefront-guided LASIK using the VISX CustomVue technology provides an effective and predictable correction of low to moderate myopia in the long term, preserving the patient's visual acuity and quality.  
[J Refract Surg. 2013;29(12):816-822.]



## Objectives

To evaluate the visual, refractive, contrast sensitivity, and aberrometric outcomes in a group of highly aberrated corneas undergoing wavefront-guided LVC surgery using the *iDesign* high definition aberrometer and the *Star S4IR* excimer laser platform from Abbott Medical Optics

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## Subjects & Methods

- 9 eyes of Nine patients with highly irregular cornea (6 females, 3 males) (Age: 20 to 52 ys.)
- Horus Vision Correction Center, Alexandria
- Nov. 2012 to August 2013
- **2 clinical groups:**
  - I- Post RK (4 eyes)
  - II- Post LASIK decentration/irregular ablation (5 eyes)

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## Subjects & Methods

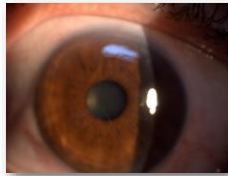
- Full preoperative evaluation for Topography, Tomography, Refraction and Visual performance evaluation
- iDesign-generated ablation profile
- PRK with MMC / LASIK redo by flap lift
- **All patients were followed up for more than 6 months**

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### CASE 2. Post RK

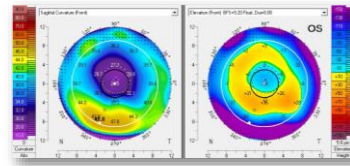
- 52 years old women
- Had RK in 1995 (8 radial cuts at 3.5 mm OZ with 2 cuts invading optical zone). Presented with a halos, glare and ghosting
- UCVA 0.1
- Manifest Refraction + 3.00 – 3.25 x 105
- BCVA 0.2
- CCC 583 μm



• Untreatable to date due to lack of capture with previous aberrometer

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### CASE 2. Post RK Preop Pentacam



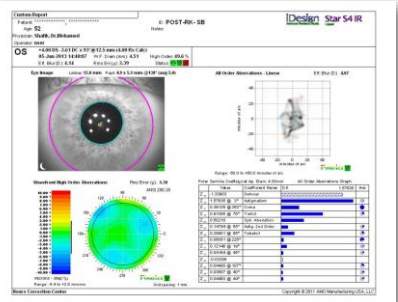
**Irregularity Indices**

Indices (in blue zone)		Asphericity (Front) at Blue	
ISV	1.00	IMA	0.78
NA	1.74	IMD	0.02
R2	1.14	IRMS	0.32
CR1	0.07	TKC	0.14

Hor: 5.7%  
Ver: 7.7%

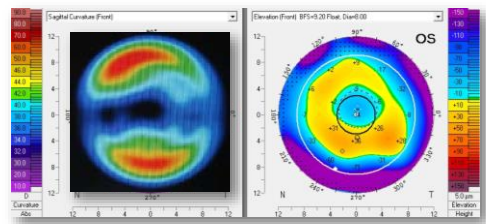
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### CASE 2. Post RK Preop iDesign MAP



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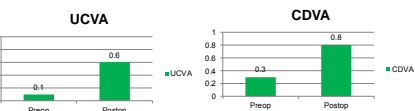
### CASE 2. Post RK Ablation Profile design over the irregular cornea



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### CASE 2. Post RK Results: 6 months after CustomVue PRK powered by iDesign

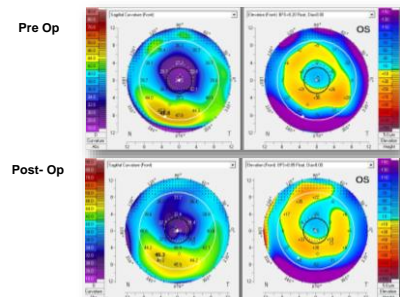
- Ablated tissue thickness 57 μm
- Manifest Refraction +0.50 -1.00 X 45



✓ Very significant improvement in Corneal Irregularity indices and Aberrations

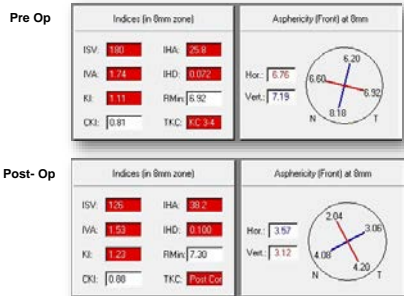
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### CASE 2. Post RK Preop vs Postop Pentacam



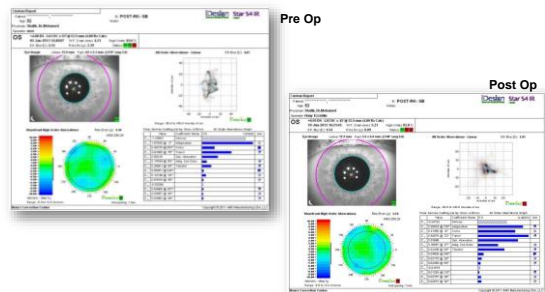
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**CASE 2. Post RK.  
Preop vs Postop Corneal Irregularity Indices**



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**CASE 2. Post RK.  
Preop vs Postop iDesign Map**



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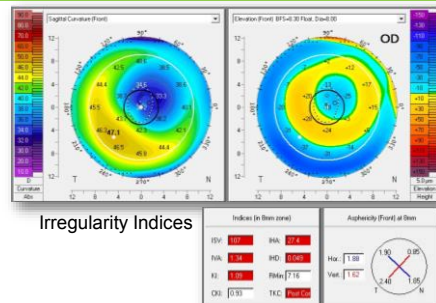
**CASE 3. Post LASIK Decentration**

- 25 y lady
- Had LASIK in July 2010 for -11.00 D. Presented with ghosting, poor night vision
- UCVA 0.1
- Manifest Refraction + -2.50 -1.00 x 120
- BCVA 0.3
- CCC 468 µm

• Untreatable to date due to lack of capture with previous aberrometer

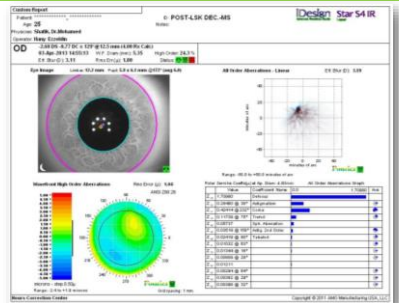
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**CASE 3. Post LASIK Decentration  
Preop Pentacam**



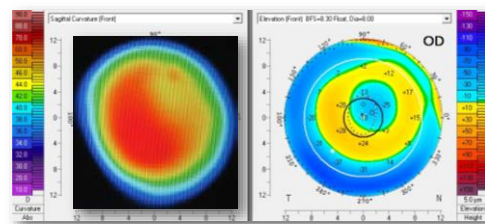
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**CASE 3. Post LASIK Decentration  
Preop iDesign MAP**



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**CASE 3. Post LASIK Decentration  
Ablation Profile design over the irregular cornea**

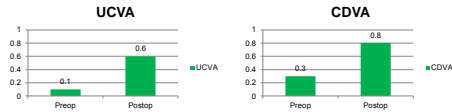


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**CASE 3. Post LASIK Decentration.**  
Results: 4 months after CustomVue LASIK powered by iDesign

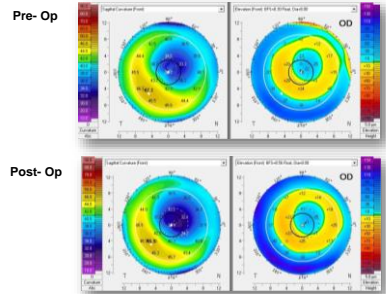
Ablated tissue thickness 41 µm

Manifest Refraction -0.75 -0.5 X180



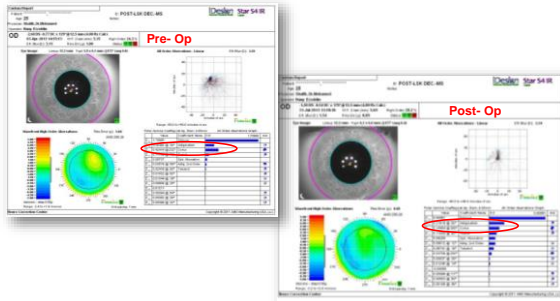
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**CASE 3. Post LASIK Decentration.**  
Preop vs Postop Pentacam



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**CASE 3. Post LASIK Decentration .**  
Prop vs Postop iDesign Map



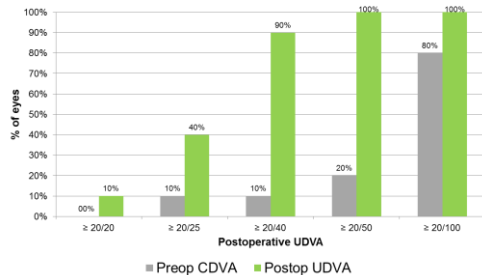
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**Results of the total Sample**

	Mean (SD) Median (Range)	Preoperative (22 eyes)	Postoperative (22 eyes)	p-value (test)
LogMAR UDVA	0.98 (0.34) 1.00 (0.40 to 1.30)	0.20 (0.10)	0.22 (0.05 to 0.40)	0.01 (Wilcoxon)
Sphere (D)	-0.78 (1.97) -0.50 (-4.00 to +3.00)	0.33 (0.70)	0.00 (-1.50 to +0.50)	0.51 (Wilcoxon)
Cylinder (D)	-2.65 (1.54) -2.50 (-5.50 to -1.00)	-1.10 (0.73)	-1.00 (-2.50 to 0.00)	0.02 (Wilcoxon)
Spherical equivalent (D)	-2.10 (1.80) -1.88 (-5.50 to +1.38)	-0.88 (0.88)	-0.63 (-2.25 to +0.25)	0.05 (Wilcoxon)
LogMAR CDVA	0.62 (0.27) 0.61 (0.10 to 1.00)	0.15 (0.10)	0.19 (0.00 to 0.30)	0.01 (Wilcoxon)
Efficacy	---	2.88 (1.50)	2.33 (1.13 to 6.00)	---
Safety	---	3.20 (1.48)	3.00 (1.13 to 6.00)	---

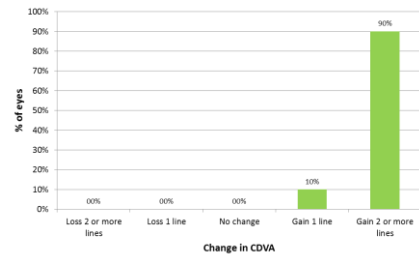
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**Efficacy**



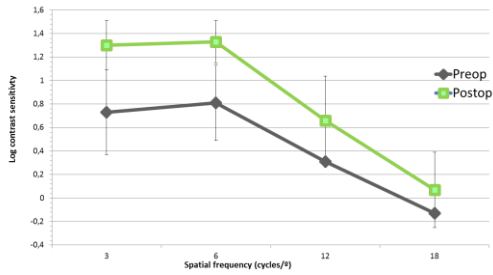
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**Changes in Corrected Distance Visual Acuity after surgery**



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## Preoperative and Postoperative Contrast Sensitivity Function



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## Conclusions

- The New iDesign System allows us to measure eyes with high aberrations that were not captured with previous aberrometers.
- With iDesign we avoid to treat the patients twice one with Topo Guided LVC to smooth the cornea and another ablation for refractive correction.
- The higher Iris Registration capture rate allows to center the ablation in the right place.
- Wavefront guided ablations are now my preferred choice for normal and highly aberrated eyes.

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