Improved astigmatism outcomes for VISX CustomVue ™ with Maximized optical zone and blend size

Mark E Johnston MD FRCSC

Nebraska Laser Eye Associates, Omaha, NE

www.nebraskaeye.com

www.markjohnstonlasik.com

In 2005 & 2006 we noted that VISX Wavefront treatment of myopic astigmatism resulted in significant overcorrection

-2.63 -2.53 x 175

Treatment Type: **LASIK** Correction Type: **CustomVue** Nomogram Change: **+10%**

Physician Adjustments - SPH (D): **-0.20** CYL (D): **+0.00** Axis(°): VTX(mm): **0.00**

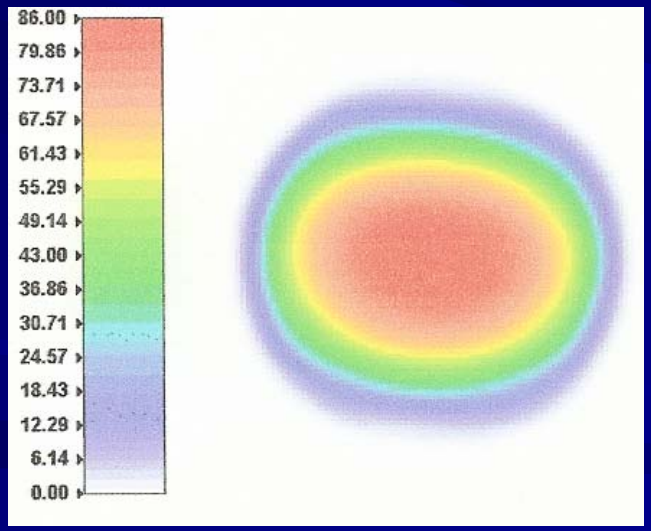
Total Correction - SPH (D): **-2.63** CYL (D): **-2.53** Axis(°): **175** VTX(mm): **0.00**

Treatment Parameters

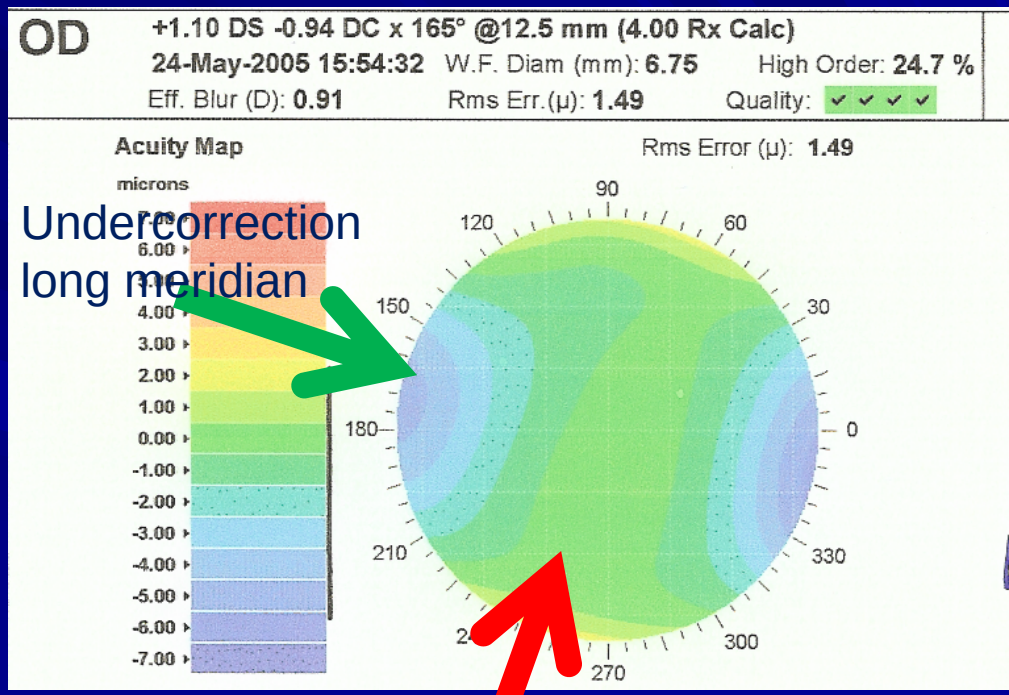
Optical Zone (mm): **6.00 x 6.67**

Ablation Zone (mm): **8.00**

Distribution of VSS Pulse Diameters



+1.10 – 0.94 x 165

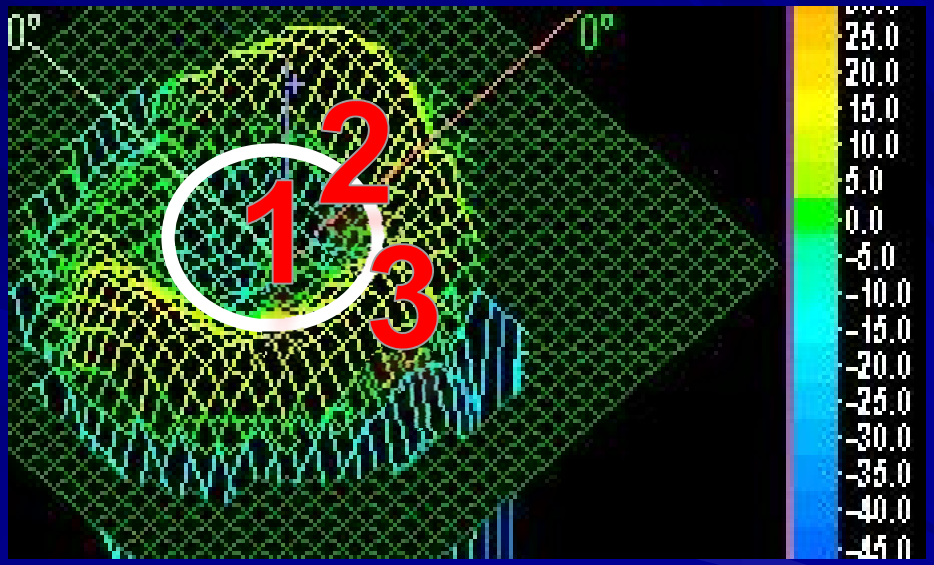


Undercorrection long meridian

Overcorrection short meridian

- *Previous studies have shown that increasing the depth of spherical and cylinder laser ablation results in an exponential :
  1. Increase in overcorrection
  2. Decrease in effective optical zone,
  3. Increase in induced spherical and toric aberrations

Theoretically, we would expect the same effects with any decrease in the width of ablation.



Effective Optical Zone (EOZ) is the area within one diopter of central power

*Best fit regression modeling of excimer lasers profiles ,
M E Johnston, ASCRS, 2007

Assuming that increasing the width of the ablation would result in less overcorrection, beginning in July 2006, all eyes with more than 1.5 Diopters of astigmatism were treated with:

a blend zone adjusted to the Maximal 9.0 mm

thereby maximizing the optical zone to 6.00 by 7.00 mm

Treatment Type: **LASIK** Correction Type: **CustomVue** Nomogram Change: **+10%**

Physician Adjustments - SPH (D): **+0.00** CYL (D): **+0.00** Axis(°): VTX(mm): **0.00**

Total Correction - SPH (D): **-0.80** CYL (D): **-1.92** Axis(°): **98** VTX(mm): **0.00**

Treatment Parameters

Optical Zone (mm): **6.00 x 7.00**

Blend Zone (mm): **9.00**

Max. Ablation Depth (µ): **41.3**

No. of Tissue Pulses: **366**

Treatment Time (sec): **19**

Surgical Parameters

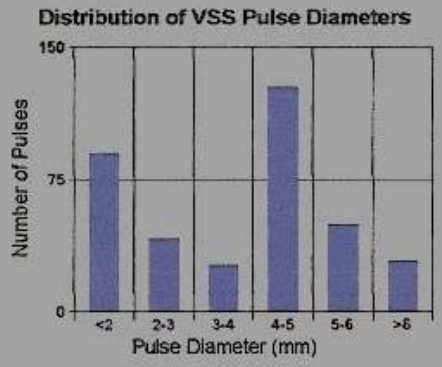
Flap Diameter (mm): **9.50**

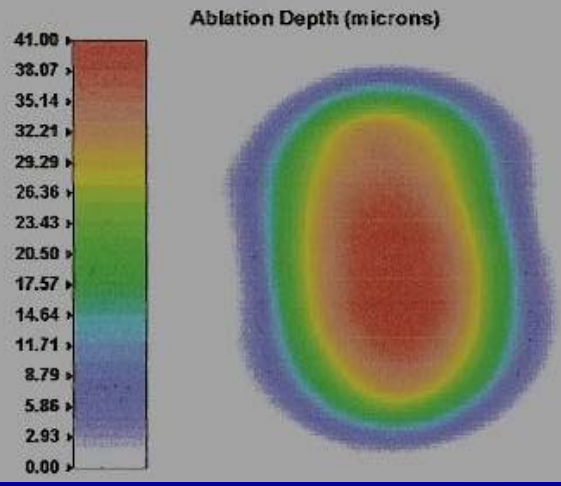
Flap Thickness (µ): **140**

Residual Bed Depth (µ): **331**

Additional Information

The Manifest and WaveScan refractions do not match

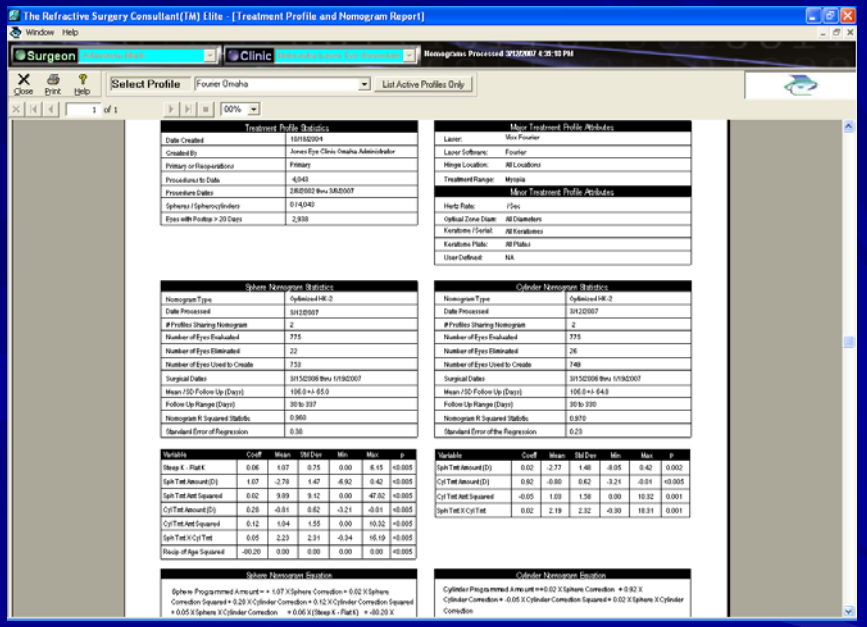




VISX CustomVue ™ was used to perform excimer laser ablations on patients with one to six diopters spherical equivalent using either the standard 8.0 mm blend zone (Standard) or maximal 9.0 mm blend zone(Maximized)

Method

- Refractive outcomes were analyzed using a commercial outcome software program, the Refractive Surgery Consultant ™ (RSC), which provides a best fit regression nomogram equation for both sphere(S) and cylinder(C).

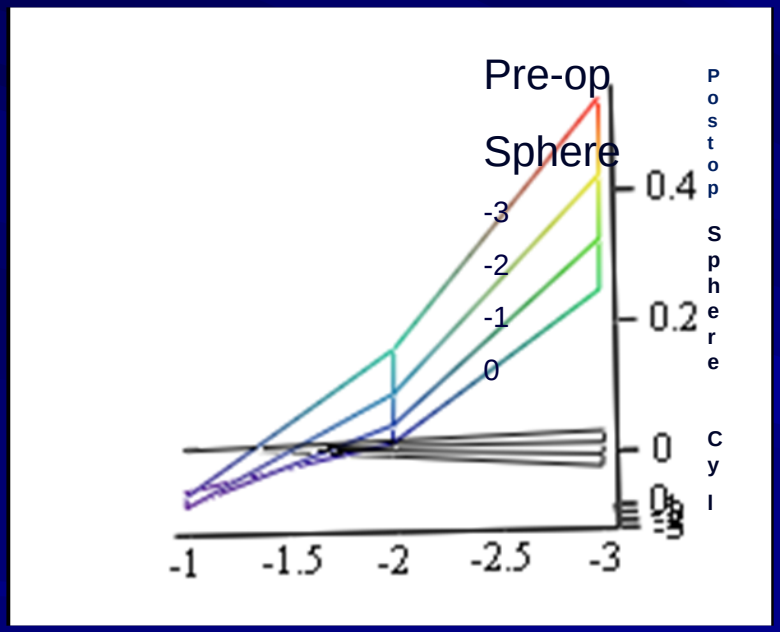


Program developed by Dr Jack Holladay and Dr Guy Kezirian

RSC Nomogram Results: Normal vs. maximized optical zone (MOZ)

Best fit regression RSC for Standard (1044 eyes) is $S=1.07s +0.01s^2 +0.17c +0.08c^2 +0.05sc$ (r^2 0.97) $C=1.02c +0.01sc$ (r^2 0.85).

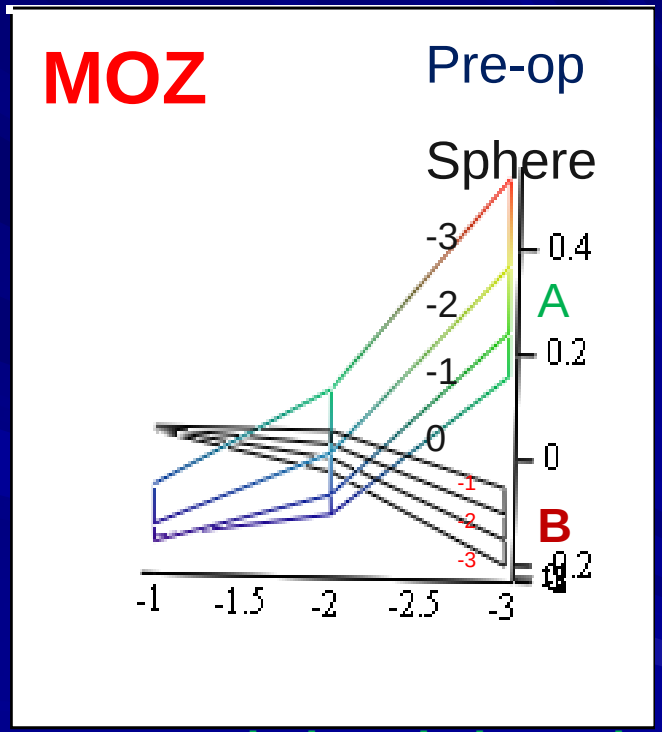
Standard WF



Pre-op cylinder

July 2006 n=1044

Best Fit Regression (RSC) for Maximized (753 eyes) is : $S=1.07s +0.02s^2 +0.29c +0.12c^2 +0.05sc$ (r^2 0.96) $C=0.92c-0.05sc +0.02s$ (r^2 0.97).



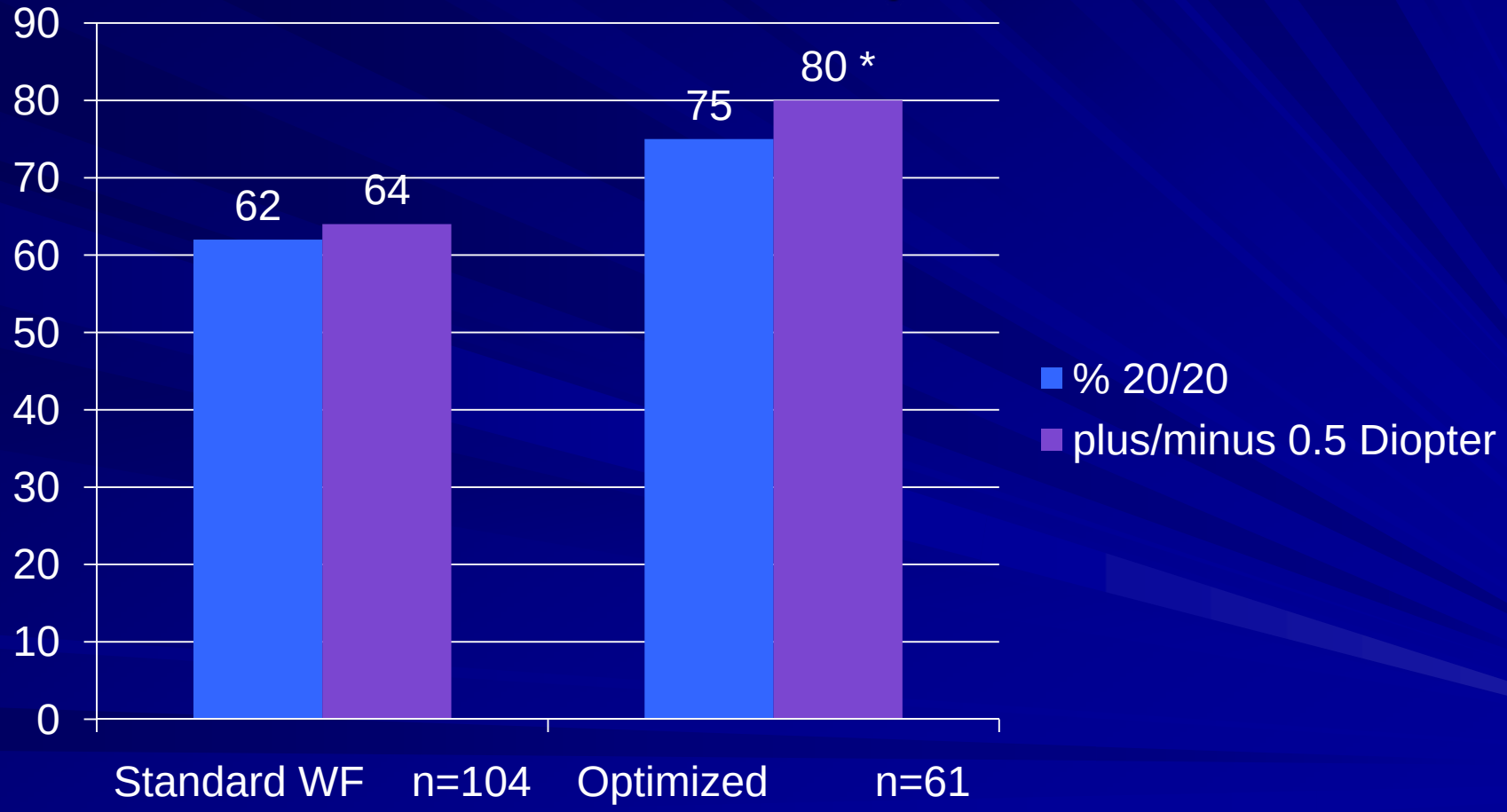
A:Less induced plus sphere

B: Under-correction of cylinder

• Normalized spherical equivalent

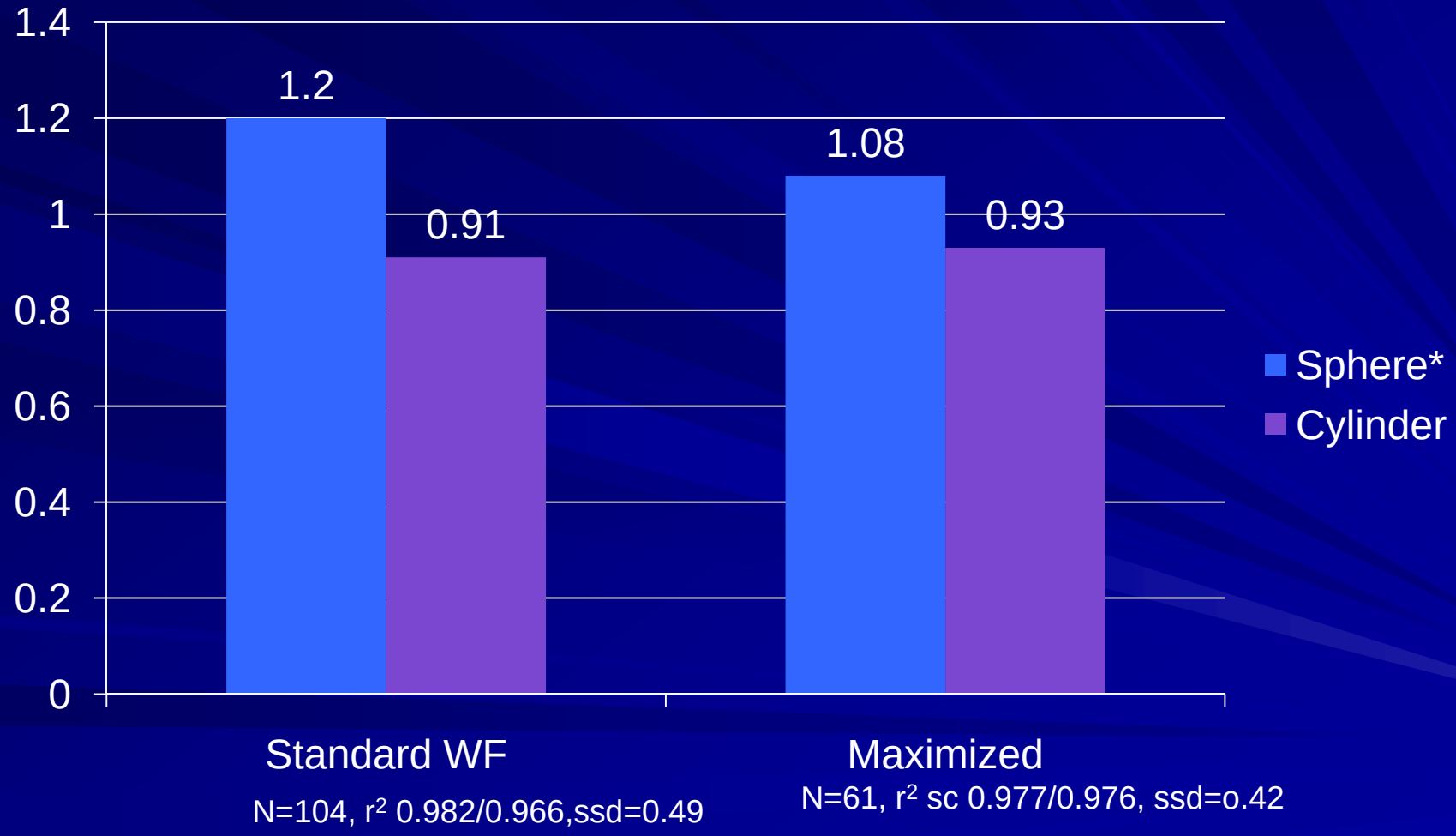
March 2007 n=753

When pre-op Cylinder is over 2.00 Diopters, better visual and optical results were noted with Maximized Optical Zone



*Statistically significant p=0.0001

With Cylinder greater than 2.00 D, the achieved versus attempted ratio for sphere and cylinder was normalized for Maximized OZ



N=104, r^2 0.982/0.966,ssd=0.49

N=61, r^2 sc 0.977/0.976, ssd=o.42

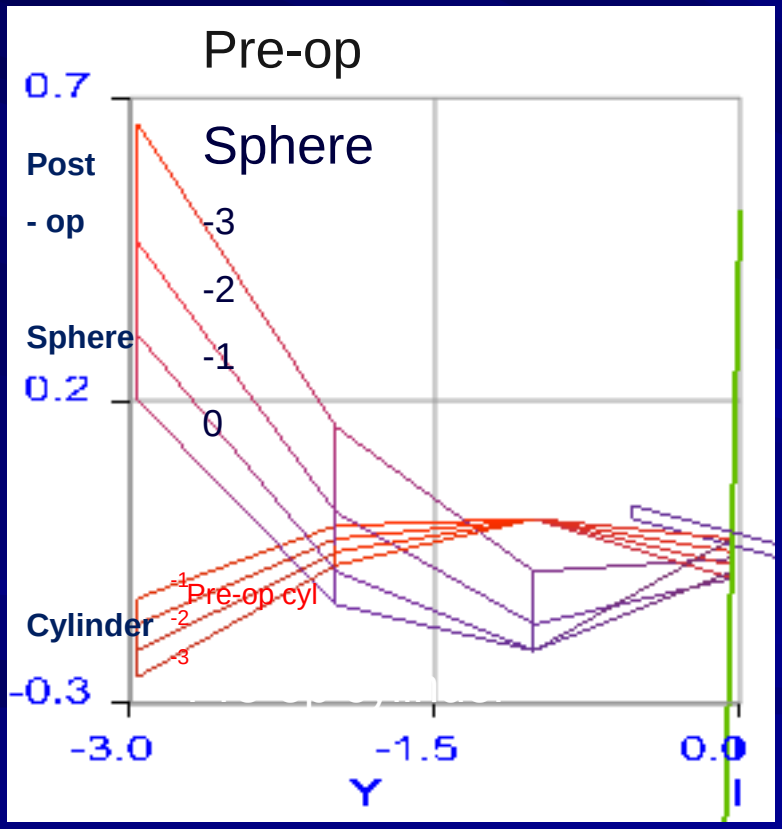
*Statistically significant (p=0.0003)

No statistically significant difference was noted between Standard and Maximized for Low Cylinder

Current (2008) VISX Myopic Wavefront nomogram using maximized optical zone

(Some of the improvement noted may be related to an averaging effect from including high myopia wavefront cases)

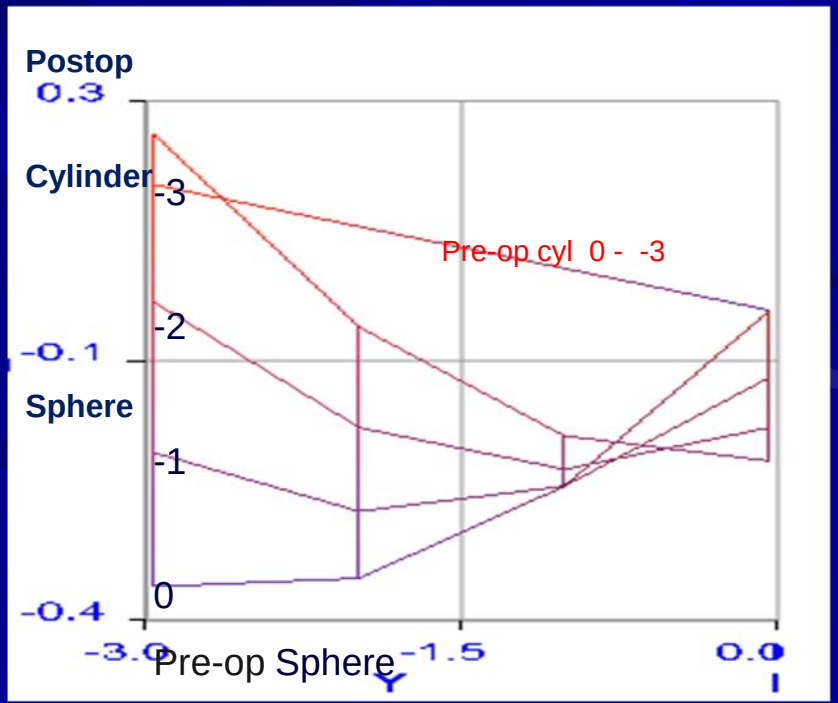
March 2007



March 2008

S=1.09s+0.01s2=0.26c+0.05c2+0.08sc
(r2=0.95,se=0.37,n=666

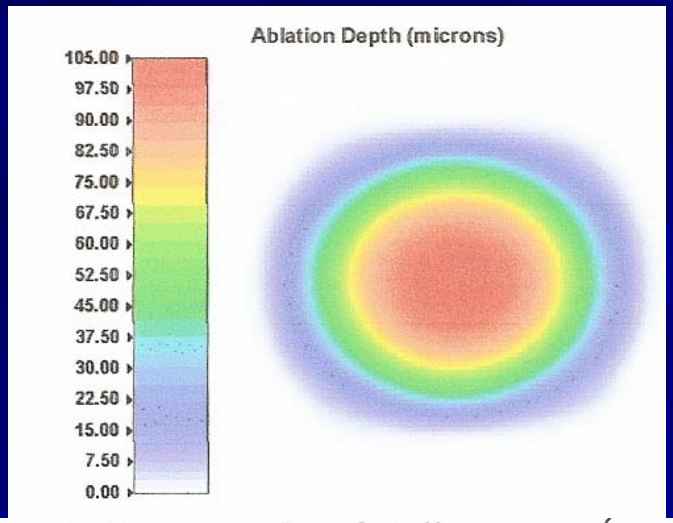
c=0.95c
(r2=0.97,se=0.21,n=666)



Conclusion

For patients with Cylinder over 2 Diopters, Maximized Optical Zone:

- •requires less nomogram adjustment
- •provides superior clinical outcomes



Treatment Type: **LASIK** Correction Type: **CustomVue** Nomogram Change: **+0%**

Physician Adjustments - SPH (D): **+0.20** CYL (D): **+0.00** Axis(°): VTX(mm): **0.00**

Total Correction - SPH (D): **-4.38** CYL (D): **-2.10** Axis(°): **1** VTX(mm): **0.00**

Treatment Parameters

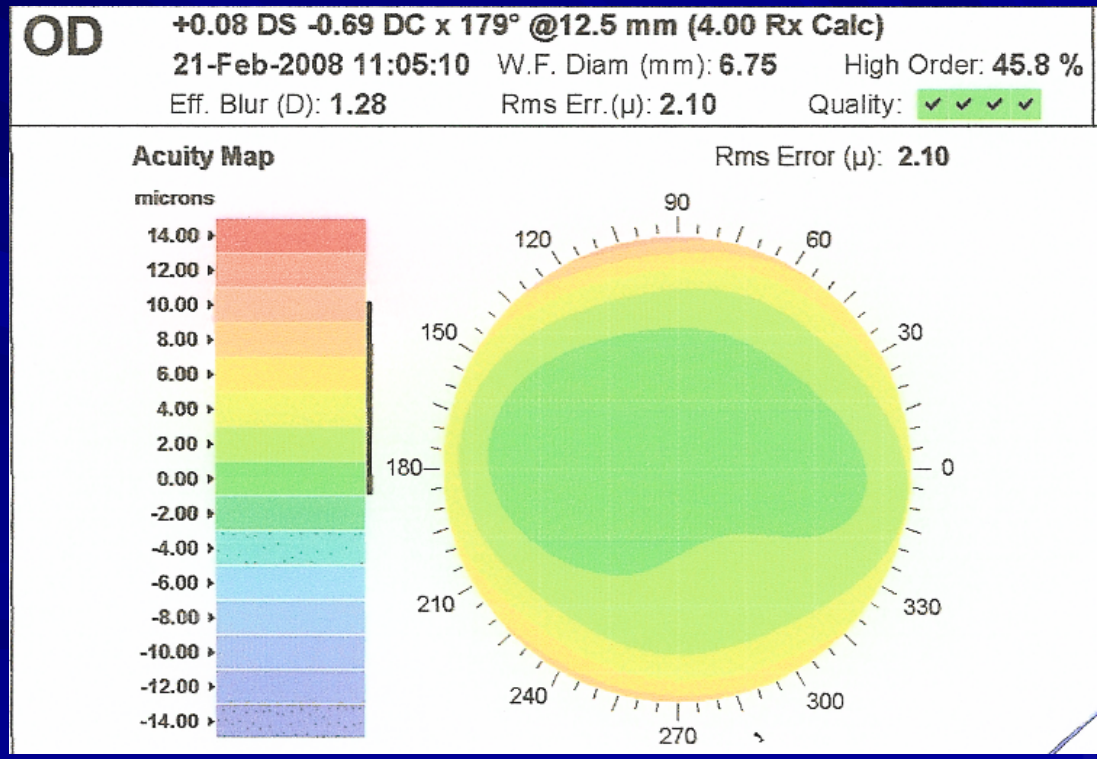
Optical Zone (mm): **6.00 x 7.00**

Ablation Zone (mm): **9.00**

Distribution of VSS Pulse Diameters

300

-4.38 -2.10 x 1



+0.08 – 0.69 x 179