Ocular Wavefront Treatment
When? Why? How?

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Problems for OWF

- Pupil size
- Accommodation

![Accuracy vs Pupil Size](chart.png)

When to use WF treatments

- Large pupil
- Consistent scan sequence

Note that even AF treatments are based on WR

**Recommendation ***

*START WITH OWF SCAN at every routine pre-LASIK consultation*
In routine treatment

- Pupil size >5.5mm (for OZ = 6.5mm)
- 3 scan sphere range <0.5D
- 3 scan cyl range <0.5D
- 3 scan axis range <15° (if cyl >0.5D)

- Target refraction = actual + 0.5*(MRSE-WRSE)

Achieved Spherical Equivalent Refraction (D) vs Attempted Spherical Equivalent Refraction (D)

- Amaris OWF Myopic LASIK 2013
  - 164 eyes
  - 3 month results

- A linear regression equation:
  \[ y = 1.0386x - 0.0013 \]
  \[ R^2 = 0.9818 \]

- MRSE Error
  - Mean = 0.19D
  - SD = 0.33

- Pre-op MRSE
  - Mean = -4.98D
  - SD 2.29D
  - Range = -1.00 to -10.25D
Spherical Equivalent Attempted vs Achieved

Amaris AF Myopic LASIK 2013
99 eyes

\[ y = 1.0201x + 0.0379 \]
\[ R^2 = 0.9883 \]

MRSE Error
Mean = 0.14D
SD = 0.29

Pre-op MRSE
Mean = -5.11D
SD = 2.52D
Range = -0.75D to -10.63D
Why OWF?

• Perceived benefits (marketing)
• Visual quality
• Protection from human error
• Accuracy (MR±0.5D** vs WR±0.25D*)


Optom Vis Sci 2007 May;84(5):387-92 - WR>MR
Visual Quality

Myopic LASIK treatment type

- OWF vs. AF: p=0.03 (t test)
- OWF vs. iDesign: p=0.39 (t test)
Amaris OWF Myopic LASIK 2013
164 eyes
3 month Results

±0.50D = 92.1%
AF Refractive Astigmatism

Amaris AF Myopic LASIK 2013
99 eyes
3 month results

±0.50D = 88.9%
±1.00D = 99.0%
HOW?

- Dark adapt
- OWF scans before other scans
- Standard instructions
- Head position – no tilt
- Quick acquisition
- 3 good scans per eye
- Registration image – SCC/centroid shift
- NO PUPIL OFFSETS
Irregular astigmatism – why OWF?

- Manifest
  -0.50/-2.75x80 (6/15)

- Wavefront
  +1.09/-5.09x68

- Post op
  +0.75/-0.5x180 (6/7.5)

Manifest refraction very inaccurate in irregular astigmatism

Ignore if OWF scans repeatable?

42 year old DALK for KC
OWF in Irregular Astigmatism

Especially ectasia
CXL + TransPRK

*Simultaneous vs Sequential*

- Better circumscribed epithelial removal = faster healing
- Correction of defocus = faster visual rehabilitation
- Avoids ablation of cross-linked tissue
- Ablation post CXL associated with undercorrection and increased haze
LO constraints = Deeper ablation

-ve Sph Ab

Tissue removed
**Pyramid**

**Refraction**

**Laser settings**

- VD: 12.0 mm
- Sphere (D): -4.22
- Cylinder (D): -5.69
- Axis (°): 152
- Preview: -1.78
- Residual: -2.04

**Constraints**

- Tolerance: 0.01
- Sphere: 0.88
- Cylinder: 0.63
- Axis: 0°

**Passes**

- Pass 1 of 5: 00:00:07
- Pass 2 of 5: 00:00:31
- Pass 3 of 5: 00:00:32
- Pass 4 of 5: 00:01:47
- Pass 5 of 5: 00:01:40
- Total: 00:04:39

**Buttons**

- Minimize: Depth
- Update preview
- Cancel
- Apply

**Graphs**

- Current: Max ablation: 153 µm
- Ablation volume: 5962 µl
- Preview: Max ablation: 48 µm (63%)
- Ablation volume: 918 µl (84%)
- Residual: Min difference: 0 µm (0%)
- Max difference: 110 µm (72%)
- Volume difference: 4092 µl (64%)
OWF treatment

When?  Why?
• Routine LASIK – Visual quality + accuracy
• TransPRK+CXL – low ablation depths

How?
• Simultaneous registration image

Thank you  www.allan.vu