Outcomes of Wavefront Guided PRK and LASIK

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The Problems with PRK
(I consider PRK = LASEK = epi-LASIK)

Pain in the immediate postop time period

- Attaining 20/16 UCVA
- Haze/scarring
The Problems with LASIK

- DLK
- Ingrowth
- Slipped
- Buttonhole
- Striae
- Epi defect
Methods

- Prospective, randomized clinical trial
- 2 Surgeons
- VISX Star S4 CustomVue
  - Fourier, no IR
  - 6.0mm OZ with 8.0mm TZ
- IDE with FDA
- Subjects randomly assigned
  - Custom PRK (wPRK) or Custom femtosecond LASIK (wLASIK)
  - 200 patients (100 each)
- Bilateral treatment
wPRK

- Amoils brush
- BSCL, NP Tetracaine, topical antibiotic
- Two month FML taper
• Intralase flap
  – 15 KHz; 9.1mm
  – Programmed 100μ; actual 96μ
• Topical antibiotic and steroid 1wk
## Preop Characteristics

<table>
<thead>
<tr>
<th></th>
<th>wLASIK (n=200 eyes)</th>
<th>wPRK (n=198 eyes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>31.4 ± 6.6</td>
<td>29.1 ± 6.25</td>
</tr>
<tr>
<td></td>
<td>(24 to 51)</td>
<td>(21 to 47)</td>
</tr>
<tr>
<td>Sph</td>
<td>-2.68</td>
<td>-2.67 D</td>
</tr>
<tr>
<td></td>
<td>(-0.25 to -5.75)</td>
<td>(-0.75 to -5.25)</td>
</tr>
<tr>
<td>Cyl</td>
<td>-0.70</td>
<td>-0.72 D</td>
</tr>
<tr>
<td></td>
<td>(0.00 to -2.50)</td>
<td>(0.00 to -2.50)</td>
</tr>
<tr>
<td>MSE</td>
<td>-3.04</td>
<td>-3.02 D</td>
</tr>
<tr>
<td></td>
<td>(-1.00 to -6.13)</td>
<td>(-1.00 to -5.88)</td>
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# Effectiveness: 12 Months

<table>
<thead>
<tr>
<th></th>
<th>wLASIK (n=172)</th>
<th>wPRK  (n=176)</th>
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<tbody>
<tr>
<td>MSE</td>
<td>-0.04 ± 0.23</td>
<td>-0.03 ± 0.27</td>
</tr>
<tr>
<td>± 0.50 D</td>
<td>98%</td>
<td>94%</td>
</tr>
<tr>
<td>± 0.25 D</td>
<td>73%</td>
<td>73%</td>
</tr>
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</table>
12 month UCVA

- wLASIK
- wPRK

<table>
<thead>
<tr>
<th>Vision</th>
<th>wLASIK</th>
<th>wPRK</th>
</tr>
</thead>
<tbody>
<tr>
<td>20/12.5</td>
<td>51%</td>
<td>48%</td>
</tr>
<tr>
<td>20/16</td>
<td>88%</td>
<td>88%</td>
</tr>
<tr>
<td>20/20</td>
<td>97%</td>
<td>96%</td>
</tr>
<tr>
<td>20/40</td>
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</tbody>
</table>
Achieving 20/16 UCVA

- wLASIK
- wPRK

- 1 wk: 10%
- 1 mo: 59%
- 3 mo: 81%
- 6 mo: 81%
- 9 mo: 84%
- 12 mo: 88%
12 Month MSE
Attempted vs Achieved

wLASIK
\[ y = 0.92x + 0.23 \]
\[ R^2 = 0.95 \]

wPRK
\[ y = 0.99x - 0.05 \]
\[ R^2 = 0.92 \]
12 Months
Change in Best-Corrected Acuity

Mean Difference:
-0.05 LM (gain)
-0.06 LM (gain)

ns
12 Months Change in 5% Photopic BCVA

Mean Difference:
-0.03 LM (gain)
-0.04 LM (gain)

ns

Loss >=2 lines:
LASIK: 1.2%
PRK: 1.1%
Change in HOA RMS

Mean Difference:
+0.06 (increase)
+0.06 (increase)

ns

6mm pupil
PRK Change in Spherical Aberration

Decreased Sph Ab

Increased Sph Ab

Change in Sph Ab (microns)
PRK Change in Coma (magnitude)

- Decreased Coma
- Increased Coma
LASIK Change in Coma (magnitude)

Decreased Coma

Increased Coma

Change in Coma (microns)
Task Performance Evaluation: Comparison of Night Driving Ability
NDS Methodology

- 55 mph
- Rural road at night
- Each eye tested independently
- Best spectacle correction
- With and without glare (low beam headlights 50 m behind)
NDS Methodology

• Subjects push a button when:
  1) they detect a road hazard
  2) when they can identify the hazard (business sign, traffic sign, or pedestrian)
• 6 threshold measurements
• 144 measurements per subject
• Testing preop and 6 mos postop
• Observer masked
Analysis of NDS Outcomes

- There were no differences in change in performance with regard to:
  - Type of conventional laser
  - Road hazard
  - Eye tested (left/right eye)
- Data was pooled for analysis
  - Detection (with & w/o glare) = 72 tests / pt
  - Identification (with & w/o glare) = 72 tests / pt

Multivariate Tests of Significance (Wilks’ Lambda)
Preop to Postop Change in NDS Performance w/o Glare

Improved after surgery

WFG PRK

WFG LASIK
Preop to Postop Difference in NDS Performance w/ Glare

Improved after surgery

WFG PRK

Detection: +21
Identification: +27

WFG LASIK

Detection: +18
Identification: +27
Significant Change in NDS Detection

Preop-postop Δ greater than 44 feet
Significant Changes in NDS (combined wLASIK and wPRK)

- Det: 23%, Improvement: 1.6%, Reduction: 1.6%
- ID: 36%, Improvement: 2.8%, Reduction: 0.0%
- Det w/glare: 18%, Improvement: 0.0%, Reduction: 0.0%
- ID w/glare: 31%, Improvement: 4.1%, Reduction: 4.1%

Preop-postop Δ greater than 44 feet
Conclusions

- WFG femtosecond LASIK
  - Faster visual recovery
- No difference at 12 months
  - UCVA, BCVA, or photopic contrast acuity
  - Higher order aberrations
- No difference in night driving performance
  - Significant improvement
Ectasia!!

8 Wk

16 Wk

32 Wk

468µ

391µ

365µ
12 Months
Change in 25% Mesopic BCVA

Mean Difference:
-0.05 LM (gain)
-0.07 LM (gain)

ns

Loss >=2 lines:
LASIK: 1.2%
PRK: 0.6%

LASIK (n=172)
PRK (n=176)
Significant Improvement in NDS

Preop-postop Δ greater than 44 feet