OUTCOME OF REFRACTIVE SURGERY IN KERATOCONUS SUSPECT EYES

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The majority of post LASIK/PRK ectasia are observed in corneas sharing topographical similarity to forme fruste keratoconus. However, it's not known whether every suspicious cornea would undergo ectasia after LASIK or PRK.
PURPOSE

To describe retrospectively the results of LASIK and PRK done *inadvertently* in keratoconus suspect eyes.
We reviewed 1278 eye’s charts of patients that all received refractive surgery performed by the same surgeon (DG).

The technique / indications were decided based on clinical context and surgeon’s maps interpretation of:

- Orbscan®
- OPDscan® Placido analysis (no Corneal Navigator -CN- included in the OPD station software at the time of surgery)
- Ocular Response Analyzer (ORA) data (Corneal Hysteresis (CH) and Corneal Resistance Factor (CRF))

We selected eyes diagnosed as Keratoconus suspect (KCS) or Keratoconus (KC) by the CN (lately added to our OPD station).
The Nidek Corneal Navigator uses an artificial intelligence technique to recognize specific classifications of corneal topography. It calculates various indices representing corneal shape characteristics and it gives for each condition a percentage of similarity ranging from 0 to 99%.

This software was not available at the time of the surgery but was added later on our OPD machine.
13 EYES Classified KCS By THE NCN

OPD SCAN TOPOGRAPH
## RESULTS

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<tr>
<th></th>
<th>MSE</th>
<th>CCT</th>
<th>Age</th>
<th>CH</th>
<th>CRF</th>
<th>% Similarity</th>
<th>CH-CRF</th>
<th>Post Elevation</th>
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- Mean Age (y): 32.6 +/- 8.4
- Mean Spherical Equivalent = -4.5 +/- 1.7 D
- M CCT= 541 +/- 28 microns
- % similarity KCS (OPD): 49.4 +/- 21.1 %

- 8 eyes had LASIK and 5 had PRK
- At 3 years of follow up: 100% +/- 0.50D intended correction
- **No topographical sign of ectasia**
RESULTS

Case examples: 5 and 6:
Refraction: OD: -4.25 (-2.00 x 125)
OS: -7.50

Pre Lasik

OD: plano -0.50 x 115
OS: -1.25 -0.50 x 150

Post Lasik

Refraction
Binder reviewed 1702 eyes with normal topographies and found that 19.6% had an Ectasia Risk Score of 3 or higher without any eye developing ectasia. The author concludes that this scoring system should not be used to eliminate potential LASIK candidates with normal topography.

We reviewed eyes with abnormal topographies. Their mean Ectasia Risk Score was 3.1 +/- 1.9. 6 eyes got Lasik with an Ectasia Risk Score ≥ 3 without any of them developing ectasia. Thus other risk factors or protective elements for developing or not post Lasik ectasia are still unknown.
DISCUSSION

The diagnosis of preoperative KCS condition was made objectively, based on the Nidek Corneal Navigator System.

It’s specificity is less than 100% → Surgery could have been made on « false positive for KCS » patients?

- In the first paper describing keratectasia, Seiler stated that « refractive surgery reduces the biomechanical strength of the cornea which may lead to mechanical instability and keratectasia »

- Binder studied more than 9000 eyes having at least one of the known risk factor for ectasia without any of them developing this complication. He asked: « WHAT IF ALL OF THE REPORTED ECTASIA CASES HAD A SINGLE AS YET UNDEFINED UNDERLYING CONDITION THAT PREDISPOSED THE EYE TO DEVELOPPING ECTASIA? »

- Corneal biomechanics: determining the outcome?

CH and CRF of a non-operated KCS population vs. CH and CRF of the 13 operated eyes.

We compared CH and CRF of operated eyes to a population of KCS corneas that were rejected for surgery.

<table>
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<tr>
<th>OPERATED EYES</th>
<th>KCS SUSPECT GROUP</th>
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<tbody>
<tr>
<td>CH (mmHg)</td>
<td>11.5 +/- 1.8</td>
<td>9.8 +/- 1.6</td>
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<tr>
<td>CRF (mmHg)</td>
<td>11.4 +/- 1.7</td>
<td>9.4 +/- 1.6</td>
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The biomechanical properties of the operated eyes were significantly higher than those of a non-operated KCS group.
CONCLUSION

1) WE HAVE INADVERTENTLY PERFORMED LASIK AND PRK ON PATIENTS WITH KERATOCONUS SUSPECT PLACIDO SIMILARITY.

2) THEY COULD BE FALSE POSITIVE FOR KCS?

3) WE DO NOT HAVE ECTATIC OUTCOME YET?

4) CORNEAL BIOMECHANICS MAY INFLUENCE THE OUTCOME.

5) UNDEFINED UNDERLYING CONDITIONS THAT MAY PREDISPOSE THE EYE TO DEVELOPPING ECTASIA ARE STILL TO INVESTIGATE.