Improving decision making in crosslinking treatments

*The DUtch Crosslinking for Keratoconus (DUCK)* score

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When is a CXL treatment indicated?

- Global consensus (Delphi method): perform CXL when progression is documented: “no matter what age or level of vision”
How should we define progressive keratoconus?

- >1 D progression in keratometry ($K_{\text{max}}/K_{\text{mean}}$) is the Word$^{1-3}$

- **Pros:**
  - Easy to use parameters with adequate repeatability$^{4-5}$

- **Cons:**
  - Visual acuity, refractive errors, contact lens tolerability, associated symptoms are now not considered
  - Where is the patients perspective? Should we treat the patient or their topograms?

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Consequences of treating topograms

Nationwide reduction in the number of corneal transplantations for keratoconus following the implementation of cross-linking

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Is only half of the equation!

What is needed?

• A rational weighted compound score that
  – Encompasses relevant clinical domains in progressive KC
  – Takes the patients perspective in consideration
  – Is easy to use

• The DUtch Crosslinking for Keratoconus score
  – Age
  – Subjective changes in quality of vision
  – Changes in UDVA
  – Changes in Refraction (SE)
  – Changes in Keratometry ($K_{\text{max}}$)

• 0, 1 or 2 points per item, lead to a 0-10 point score
Conclusion of study results (n=332 eyes)

• Evaluation of longitudinal 2-year cohort of all KC patients

• When applying a 5/10 DUCK score vs. >1D of $K_{\text{max}}$ threshold

  18% lower rate of treatment

  11% reduction of under-treatment

  13% lower failure rate
Methods

• Inclusion/exclusion criteria for analysis:
  – All keratoconus patients referred between Jan 1\textsuperscript{st} 2012 & July 1\textsuperscript{st} 2014
  – No cases unsuitable for CXL treatment (too thin, scars etc)

• Data collection
  – UDVA/CDVA, manifest refraction, Scheimpflug tomography
  – Patient experiences / remarks / complaints
  – Treatment characteristics

• Three measurements in time
  1. First consultation
  2. Progression analysis
  3. 12mo after CXL or after last consultation
Results

- 159 / 332 eyes underwent CXL (48%)
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• 129 treatments based on $K_{\text{max}} > 1\text{D}$ in one year
• 106 treatments based on DUCK score > 5 (18%↓)
• 14 cases of progressive KC treated with DUCK (11%)
Discussion

• Large cohort of 332 consecutive KC cases with adequate follow-up

• The DUCK score was evaluated in retrospect
  – CXL treatments were not necessarily based on either criterion
  – Natural course of disease could not be incorporated

• All eyes of all patients were included
  – Complex statistics
  – Multiple imputation used to complete the dataset

• Validation of findings mandatory
  – Multicenter data acquisition to compare & pool data
  – Collaboration with Maastricht & Antwerp
Summary

• Defining keratoconus progression is fundamental in clinical decision making in CXL

• Targeting the right patient for therapy
  – Prevents unnecessary exposure to treatment risks, and
  – Increases overall cost-effectiveness

• Adhering to the DUCK-score as a weighted compound measurement of keratoconus progression lead to
  – 18% less treatments performed in likely low-risk cases
  – 11% more treatments performed in potential progressive cases
  – 13% lower treatment failure rates due to a higher threshold
