

ADVANCES IN KERATOCONUS CARE

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PhD SUMMARY

The cornea is the clear, dome-shaped ‘window’ located at the very front of the eye. It serves as a protective membrane and helps to focus light rays on the retina, the light-sensitive layer of the eye. In keratoconus, the normal regular shape of the cornea is progressively lost: the cornea thins, steepens and takes on the shape of a cone.



Keratoconus typically develops in adolescence in both eyes, albeit asymmetrically, and progresses at a variable rate until the 3rd or 4th decade of life. The main objective of this thesis was to gain more insight in how the diagnostic and therapeutic advances of the past two decades impact the care for patients with keratoconus.

Modern day corneal imaging devices allow very detailed analysis of the cornea. In our first paper, we investigated the inherent variability of measurements in eyes with varying degrees of keratoconus. The variability in parameter values of repeated measurements is clinically relevant in eyes with keratoconus and needs to be taken into account when assessing these eyes for therapeutic purposes.

In 2003, a novel technique was developed, named corneal crosslinking, which allows to strengthen the cornea in keratoconus. This technique stops the progression of keratoconus but does not cure the disease nor does it markedly improve vision. Early diagnosis is therefore advised to optimise treatment outcomes. In our second paper, we discussed the current diagnostic and referral patterns of keratoconus. Data of this study illustrates the difficulty of early diagnosis of keratoconus at the primary eye care level.

The clinical benefit of corneal crosslinking can be improved by earlier diagnosis and referral. In our third paper, we presented the results of a school-based screening study. Screening based on visual acuity and automated refraction allowed detection of both keratoconus and inadequately corrected refractive errors but further research is needed to assess whether the benefits of this screening strategy outweigh the additional costs of screening.

Promotors

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Supervisors

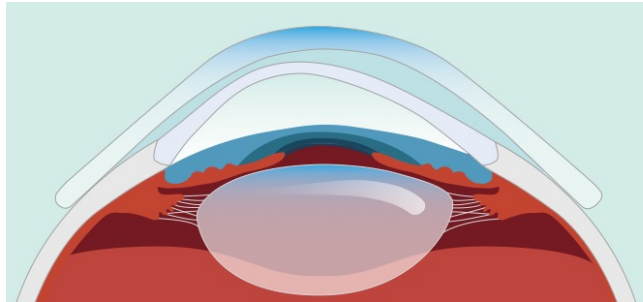
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Several types of specialty contact lenses are available nowadays to improve vision in keratoconus. Scleral lenses in particular, large-diameter rigid lenses that rest on the sclera (white tissue surrounding the clear cornea) have undergone major advances over the past two decades.



In our fourth paper, we investigated the role of scleral lenses in improving vision-related quality of life in patients with keratoconus. Fitting of these lenses was found to significantly improve both the visual functioning and the socioemotional status.

The outcome of scleral lens fitting was also studied (paper 5 and 6) in two subgroups that typically require corneal transplant surgery: very advanced keratoconus and post-hydrops keratoconus. Corneal hydrops occurs when one of the posterior layers of the cornea ruptures due to extensive stretching, and the cornea takes up an excessive amount of fluid from the inside of the eye. The associated swelling disappears over the course of 3-4 months, leaving behind a corneal scar. Scleral lens fitting in these two subgroups of keratoconus eyes allowed for satisfactory vision in the majority of patients and considerably reduced the need for corneal transplant surgery.

The role of hybrid lenses in the correction of keratoconus was studied in the seventh paper. Hybrid lenses consist of a central rigid lens (for vision), surrounded by a soft skirt (for comfort). Theoretically, they combine the best of both worlds, but in clinical practice, the outcome of these lenses remains suboptimal. The role of hybrid lenses remains rather limited in the overall optical correction of patients with keratoconus.

In conclusion, keratoconus care has evolved immensely over the past two decades. The advent of corneal crosslinking and innovations in contact lens care have both shifted the desired timing of treatment to earlier in the disease and have reduced the need for corneal graft surgery.

Publications included in this thesis:

- 1/ Kreps EO, Jimenez-Garcia M, Issarti I, Claerhout I, Koppen C, Rozema JJ. Repeatability of the Pentacam HR in Various Grades of Keratoconus. *Am J Ophthalmol.* 2020;219:154-162.
- 2/ Kreps EO, Claerhout I, Koppen C. Diagnostic patterns in keratoconus. *Cont Lens Anterior Eye.* 2020;S1367-0484(20)30103-X. doi:10.1016/j.clae.2020.05.002.
- 3/ Kreps EO, Collet S, Koppen C, Claerhout I. School-based vision screening in adolescents. [submitted to *Cont Lens Anterior Eye*, in review].
- 4/ Kreps EO, Pesudovs K, Claerhout I, Koppen C. Mini-Scleral Lenses Improve Vision-Related Quality of Life in Keratoconus. *Cornea.* 2020 Sep 16. doi: 10.1097/ICO.0000000000002518.
- 5/ Koppen C, Kreps EO, Anthonissen L, Van Hoey M, Ni Dhubbghaill S, Vermeulen L. Scleral Lenses Reduce the Need for Corneal Transplants in Severe Keratoconus. *Am J Ophthalmol.* 2018;185:43-47.
- 6/ Kreps EO, Claerhout I, Koppen C. The Outcome of Scleral Lens Fitting for Keratoconus With Resolved Corneal Hydrops. *Cornea.* 2019;38:855-858.
- 7/ Kloeck D, Koppen C, Kreps EO. Clinical Outcome of Hybrid Contact Lenses in Keratoconus. *Eye Contact Lens.* 2020 Sep 29. doi: 10.1097/ICL.0000000000000738.

Curriculum Vitae

Work and education

2018-2021: PhD Fellow, Ghent & Antwerp University
2017: Cataract Fellow, Isala Hospitals, Zwolle, Netherlands
2015 & 2016: LAS Specialty Registrar, Sheffield Teaching Hospitals, UK
2013-2017: Residency Ophthalmology, Ghent University Hospital
2006-2013: Bachelor & Master in Medicine, magna cum laude, Ghent University

Awards and grants

2019-2021: Recipient of PhD grant (Fonds voor Innovatie en Klinisch Onderzoek) from Ghent University Hospital, Ghent
2017: Travel grant for ESCRS for the best national case, Théa Trophy
2016: Highest Overall Score worldwide at the International Council of Ophthalmology (ICO) Clinical Sciences Exam

Research output

Published A1 peer-reviewed articles: 23
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Thesis available online at biblio.ugent.be

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