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Editorial

Corresponding author
Raúl Martín, OD (EC), MSc, PhD
Optometry Research Group
IOBA Eye Institute
University of Valladolid
Valladolid 47002, Spain;
School of Health Professions
Plymouth University
Plymouth PL4 8AA, UK
Tel. 983 184848
E-mail: raul@ioba.med.uva.es

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Fitting Gas Permeable Contact Lens in Keratoconus; Still a Challenge?

Sara Ortiz-Toquero, OD (EC), MSc[1]; Raúl Martín, OD (EC), MSc, PhD[1,2*]

[1]Optometry Research Group, IOBA Eye Institute and Departamento de Física Teórica, Atómica y Óptica, University of Valladolid, Valladolid 47002, Spain
[2]School of Health Professions, Plymouth University, Plymouth PL4 8AA, UK

Gas permeable (GP) contact lenses (CL) are of paramount importance in keratoconus patient management[1] to rehabilitate vision and improve patients' quality of life (QoL).[2] Different surgical and non-surgical options are available in keratoconus management. Early stages could be managed with conventional optical corrections (spectacles and/or soft CL), however if disease progress, and corneal irregularity affects to visual acuity GP (conventional or with keratoconus specific design) lenses should be necessaries to patients' visual rehabilitation. Other alternative CL options (piggy-back, mini-scleral, semi-scleral, scleral designs etc.) have been, also, proposed. If patients show CL intolerance or disease progresses and/or corneal integrity could be affected surgical techniques are required.

Keratoconus diagnosis and management is a challenge. The first difficulty is related with an accurate identification of keratoconus patient.[1] Clear diagnosis of early stage (in opposition to moderate or advanced disease), subclinical keratoconus, or how distinguish keratoconus from other ectatic diseases imposes greater diagnostic challenges.[1,3] A complete eye exam is necessary to confirm keratoconus diagnosis, make the differential diagnosis with subclinical keratoconus and differentiate of other ectatic diseases. Anterior eye investigation; based on slit lamp findings (stromal thinning, conical protrusion, Fleischer ring and Vogt striae); corneal tomography (Scheimpflug or optical coherence tomography) assessing anterior and posterior corneal surface; and full corneal thickness map analysis (because normal central thickness could be present in keratoconus cornea) are mandatory. Anterior topographical analysis (Placido-based topographers) still plays a relevant role in keratoconus detection, especially in primary care, because these devices are one of the most extensively used in clinical practice[4,5] and aid to differentiate between keratoconus and pellucid marginal degeneration (PMD).[1] Patients' history may identify major risk factors for keratoconus; such as: down syndrome, relatives of affected patients, ocular allergy, Asian or Arabian ethnicity, eye rubbing, floppy eyelid syndrome, atopy, connective tissue disorders (Marfan syndrome), and others.[1,6]

The second challenge is related with disease classification because there is no clinically adequate classification system for keratoconus disease.[1] Amsler-Krumeich classification[7,8] and collaborative longitudinal evaluation of keratoconus (CLEK)[9] classifications are the most commonly used to classify the keratoconus severity. Amsler-Krumeich classification proposes four different levels using refractive, topographic and biomicroscopic corneal signs. The CLEK classification[9] proposes to use the average corneal power and root mean square (RMS) error for higher-order Zernike terms (derived from the first corneal surface wavefront) combined with clinical biomicroscopic signs. However, both classifications fail to address current information and technological advances[1] and a new classification criterion is necessary. Although, there is a lack of consensus in this issue, high order corneal aberration analysis could play a relevant role in future keratoconus classification[3] because larger values of vertical coma has been founded in these patients.[4,9-11] Clinical progression requires changes in at least 2 of these 3 parameters; corneal steepening (anterior and/or posterior) and progressive corneal thinning.[1] That means that disease progression is directly dependent of the accuracy and reliability of the corneal device used in patient assessment.[5,10]

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After diagnosis and gradation of the keratoconus disease, management and treatment could be the third challenge. Two major approaches; surgical and non-surgical management have been proposed, with the objective of halt progression of the disease and patients' visual rehabilitation. Non-surgical approach may be the first action in patient management (less invasive therapeutic strategies), highlighting GP CL fitting to improve patients' vision, although GP CL wear do not halt the progression of the disease.[12] Patient education avoiding eye rubbing is, also, necessary.[1,6]

Different surgical options are currently available without clear consensus regarding what could be the best surgical approach for keratoconus. Corneal cross-linking (CXL) has been proposed in patients younger than 40 years to halt disease progression with limited evidence provided by properly conducted randomized controlled trial (RCT)[13] and requires a well-documented clinical progression or risk of progression patient. It is, also, unclear it uses in subclinical keratoconus patients.[1] Light improvement of visual acuity (1 to 2 Snellen lines) could be expected after CXL.[14] Descemetic deep anterior lamellar (dDALK), in patients without Descemet membrane compromise, or penetrating keratoplasty (PK) are the "techniques of choice" when a corneal transplant was needed (in advance disease stages; severe corneal thinning; or in non-CL tolerant patients). These techniques achieved best-corrected visual acuity of 20/40 or better in 3 of 4 patients,[15] with insufficient evidence to determine which technique offer better overall outcomes.[16] Intracorneal ring segment (ICRS) increases corneal stability decreasing the astigmatism asymmetry helping in normalization of the corneal contour with slight improvement of patients' visual acuity,[12,17] without clear consensus about its indication.

Notwithstanding, if patient is satisfied with their vision (with spectacles or CL) no surgical treatment is indicated (except CXL), so visual rehabilitation of keratoconus patient is of paramount importance.[1] Although GP CL raises keratoconus patients' visual acuity (VA) near to 20/20,[18] achieve the correct lens parameters is a challenge to practitioners and patients[19] requiring several diagnostic lenses to achieve a final acceptable GP lens fit, which prolongs practitioner and patient chair time. To improve CL fitting procedure, different CL design and strategies have been proposed. For example, the use of CL fitting software linked with different corneal topographers could help in GP lens fitting[20,21] but, a lack in clinical studies that analyze the real impact of these software in clinical practice exists. Some of these software propose GP lens with systematic bias that could be improve with new equations.[22]

Recently, a new clinically validated open access web-calculator (www.calculens.com) has been developed with the aim to aid CL practitioners to calculate CL parameters of the GP lens to be fitted in keratoconus patients (European Academy of Optic and Optometry 2016 Meeting). This new tool will allow that keratoconus patients receive the most adequate lens and help CL practitioners to provide a sound fitting process, decreasing the number of diagnostic lenses, trials, and chair time to those achieved in standard GP CL fitting.[23] Therefore with this new tool, keratoconus management with GP CL will be not a challenge any more; and both, patients and practitioners, will be benefited.

In conclusion, Keratoconus is a multifactorial disease with genetic, biochemical, biomechanical, and environmental pathophysiology[1]; that requires a multiprofessional approach for early detection, correct diagnosis, follow-up, monitoring and adequate patient management that involve; primary eye care practitioners, optometrists, CL practitioners and ophthalmologists with the last aim to provide better care and improve patients' quality of life.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

REFERENCES

1. Gomes JA, Tan D, Rapuano CJ, et al. Global consensus on keratoconus and ectatic diseases. *Cornea*. 2015; 34: 359-369. doi: 10.1097/ICO.0000000000000408

2. Ortiz-Toquero S, Perez S, De Juan V, Rodriguez G, Agustin Mayo-Iscar A, Martin R. The influence of the refractive correction on the vision-related quality of life in keratoconus patients. *Qual Life Res*. 2015; 25(4): 1043-1051. doi: 10.1007/s11136-015-1117-1

3. Sideroudi H, Labiris G, Georgatzoglou K, Ditzel F, Siganos C, Kozobolis V. Fourier analysis of videokeratography data: Clinical usefulness in grade I and subclinical keratoconus. *J Cataract Refract Surg*. 2016; 42: 731-737. doi: 10.1016/j.jcrs.2016.01.049

4. Piñero DP, Nieto JC, Lopez-Miguel A. Characterization of corneal structure in keratoconus. *J Cataract Refract Surg*. 2012; 38: 2167-2183. doi: 10.1016/j.jcrs.2012.10.022

ISSN 2475-1278 http://dx.doi.org/10.17140/OOJ-2-e004

5. Ortiz-Toquero S, Rodriguez G, de Juan V, Martin R. Repeatability of placido-based corneal topography in keratoconus. *Optom Vis Sci.* 2014; 91(12): 1467-1473. doi: 10.1097/OPX.0000000000000421

6. Gordon-Shaag A, Millodot M, Shneor E, Liu Y. The genetic and environmental factors for keratoconus. *Biomed Res Int.* 2015; 2015: 795738. doi: 10.1155/2015/795738

7. Amsler M. Kératocõne classique et kératocône fruste; arguments unitaires [In French]. *Ophthalmologica*. 1946; 111: 96-101.

8. Krumeich JH, Daniel J, Knülle A. Live-epikeratophakia for keratoconus. *J Cataract Refract Surg.* 1998; 24: 456-463. doi: 10.1016/S0886-3350(98)80284-8

9. McMahon TT, Szczotka-Flynn L, Barr JT, et al. A new method for grading the severity of keratoconus: The Keratoconus Severity Score (KSS). *Cornea.* 2006; 25(7): 794-800. Web site. https://vrcc.wustl.edu/clekarchive/pdf/31%20McMahon%20-%20A%20New%20Method.pdf. Accessed August 14, 2016

10. Ortiz-Toquero S, Rodriguez G, de Juan V, Martin R. Repeatability of wavefront aberration measurements with a placido-based topographer in normal and keratoconic eyes. *J Refract Surg.* 2016; 32: 338-344. doi: 10.3928/1081597X-20160121-04

11. Alió JL, Shabayek MH. Corneal higher order aberrations: A method to grade keratoconus. *J Refract Surg.* 2006; 22: 539-545. doi: 10.3928/1081-597X-20060601-05

12. Mandathara PS, Stapleton FJ, Willcox MD. Outcome of keratoconus management: Review of the past 20 years' contemporary treatment modalities. *Eye Contact Lens*. 2016; 11. doi: 10.1097/ICL.0000000000000270

13. Sykakis E, Karim R, Evans JR, et al. Corneal collagen cross-linking for treating keratoconus. *Cochrane Database Syst Rev*. 2015; 24: CD010621. doi: 10.1002/14651858.CD010621.pub2

14. Meiri Z, Keren S, Rosenblatt A, Sarig T, Shenhav L, Varssano D. Efficacy of corneal collagen cross-linking for the treatment of Keratoconus: A systematic review and meta-analysis. *Cornea.* 2016; 35: 417-428. doi: 10.1097/ICO.0000000000000723

15. Arnalich-Montiel F, Alió del Barrio JL, Alió JL. Corneal surgery in keratoconus: Which type, which technique, which outcomes? *Eye Vis (Lond)*. 2016; 3: 2. doi: 10.1186/s40662-016-0033-y

16. Keane M, Coster D, Ziaei M, Williams K. Deep anterior lamellar keratoplasty versus penetrating keratoplasty for treating keratoconus. *Cochrane Database Syst Rev*. 2014; 22: CD009700. doi: 10.1002/14651858.CD009700.pub2

17. Poulsen DM, Kang JJ. Recent advances in the treatment of corneal ectasia with intrastromal corneal ring segments. *Curr Opin Ophthalmol*. 2015; 26: 273-277. doi: 10.1097/ICU.0000000000000163

18. Visser ES, Wisse RP, Soeters N, Imhof SM, Van der Lelij A. Objective and subjective evaluation of the performance of medical contact lenses fitted using a contact lens selection algorithm. *Cont Lens Anterior Eye.* 2016; 39(4): 298-306. doi: 10.1016/j.clae.2016.02.006

19. Zhou AJ, Kitamura K, Weissman BA. Contact lens care in keratoconus. *Cont Lens Anterior Eye.* 2003; 26: 171-174. doi: 10.1016/S1367-0484(03)00042-0

20. Mandathara PS, Fatima M, Taureen S, et al. GP contact lens fitting in keratoconus using FITSCAN technology. *Cont Lens Anterior Eye.* 2013; 36: 126-129. doi: 10.1016/j.clae.2012.12.002

21. Nosch DS, Ong GL, Mavrikakis I, et al. The application of a computerised videokeratography (CVK) based contact lens fitting software programme on irregularly shaped corneal surfaces. *Cont Lens Anterior Eye*. 2007; 30: 239-248. doi: 10.1016/j.clae.2007.06.003

22. Ortiz-Toquero S, Rodriguez G, De Juan V, Martin R. Rigid gas permeable contact lens fitting using new software in keratoconic eyes. *Optom Vis Sci.* 2016; 93: 286-292. doi: 10.1097/OPX.0000000000000804

ISSN 2475-1278 http://dx.doi.org/10.17140/OOJ-2-e004

23. Ortiz-Toquero S, Martin M, Rodriguez G, De Juan V, Martin R. Success of rigid gas permeable contact lens fitting. *Eye Contact Lens*. 2016; 13. doi: 10.1097/ICL.0000000000000254