

Contact Lens Update

CLINICAL INSIGHTS BASED IN CURRENT RESEARCH

Article Review: Current Perspectives in the Management of Keratoconus with Contact Lenses

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Dr. Melissa Barnett is the Director of Optometry at the University of California, Davis. She is passionate about helping people improve their lives by optimizing their vision, health and wellness with a customized approach. An internationally recognized expert in specialty and scleral lenses, dry eye disease, keratoconus, and presbyopia, Dr. Barnett is a key opinion leader, frequent lecturer and advocate for expanding the scope of practice through technology and sharing best practices.

Lim L, Lim EWL. Current perspectives in the management of keratoconus with contact lenses. *Eye (Lond)*. 2020;34(12):2175-2196.

The review article "[Current perspectives in the management of keratoconus with contact lenses](#)" evaluated meaningful and relevant articles on contact lens wear in people with keratoconus (KC).¹ According to the article, KC is a noninflammatory and progressive corneal ectasia characterized by thinning and protrusion of the cornea, resulting in irregular astigmatism, myopia, and impaired vision. It is the most prevalent form of corneal ectasia and is more common than previously estimated, with a general population prevalence of 1:375. The article also reveals that over 60.6% of patients with KC are male, and the average age at diagnosis is 28.3 years. There are multiple genetic and environmental risk factors for KC, such as eye rubbing, atopy, and genetics. KC has a substantial impact on vision-related quality of life and necessitates long-term care with non-surgical and surgical management options.

Keratoconus management options

Contact lenses are essential in the visual rehabilitation of patients with KC,² and they are indicated when vision cannot be corrected to at least 20/30 with glasses.^{3,4} Corneal lenses are recommended if vision is unsatisfactory with spectacles or conventional soft contact lenses.² If corneal lenses are not successful, hybrid (rigid center with a soft skirt), toric, bitoric, KC design soft contact lenses, KC design corneal contact lenses, piggy-back, and scleral lenses may be valuable alternative options.²

The evolution of corneal cross-linking (CXL) for the surgical management of KC has revolutionized its management. Significant advancements in other surgical techniques, such as topography-guided excimer laser treatment, intracorneal ring (ICRS) placement, and intraocular contact lenses have brought about a complete transformation in KC management, either used alone or in combination with CXL. Other procedures, including photorefractive keratometry, phakic intraocular lenses, and anterior lamellar keratoplasty, have also made notable progress in advancing KC treatment. Although there may be some improvement in visual outcomes with surgical procedures, contact lens wear is often needed to improve visual outcomes postoperatively.

According to the reviewed cohort and cross-sectional studies, most patients with KC wearing contact lenses were fitted with corneal lenses. In the Collaborative Longitudinal Evaluation of Keratoconus (CLEK) study, 65% of patients wore corneal lenses bilaterally, and the majority (73%) reported good comfort with their lenses.⁴ Most patients (78%) achieved best corrected visual acuity (BCVA) of 20/40 or better in both eyes. The majority of corneal lenses (88%) were fitted with apical touch. Similarly, in the Dundee University Scottish Keratoconus Study (DUSKS), most patients with KC wore contact lenses (76% of 200 patients); 91% wore corneal lenses, 6% wore hybrid contact lenses, and 2% wore scleral lenses.³ Other results of good vision and tolerability of contact lenses

were reported in patients with KC in the United Kingdom,^{5,6} New Delhi,⁷ Israel,⁸ and Singapore.⁹ In a different longitudinal study, contact lens wear delayed the requirement for corneal surgery in 98.9% of eyes with KC due to good visual outcomes.¹⁰ Thanks to the advancement in contact lens designs that offer improved comfort, along with the implementation of CXL to halt progression, more patients with KC are able to successfully wear contact lenses, reducing the need for corneal transplantation.

Contact lens comparative studies

The feature article reported the results of studies comparing various types of corneal lenses and comparing corneal lenses to spectacles, other contact lens modalities, and habitual contact lenses in KC contact lens wearers. Among the different types of corneal lenses, the Rose K design was found to provide greater comfort,^{11,12} but there was no significant difference in BCVA compared to other corneal lenses.^{12,13} When comparing corneal lenses to spectacles, wearing corneal lenses resulted in improved vision and three-dimensional depth perception.^{12,13} BCVA did not differ significantly between Rose K and habitual lenses.¹⁴ In cases of mild to moderate KC, there was no noticeable difference in BCVA between Rose K and Kerasoft IC contact lenses.¹⁵ When comparing Rose K lenses to Zenlens scleral lenses, there were no significant differences in BCVA or contrast sensitivity, although Zenlens scleral lens wearers reported higher subjective comfort scores.¹⁶ Comparing corneal lenses to habitual lenses, two studies showed improved vision with ClearKone hybrid lenses,^{17,18} while another study did not observe a significant difference in vision between the two types of lenses.¹⁹ Patient satisfaction and vision-related quality of life were enhanced with ClearKone lenses. Overall, specialty design contact lenses, new scleral lens designs, and hybrid lenses were found to offer greater comfort than traditional corneal lenses.

Contact lens non-comparative studies

In mild to moderate KC, soft lenses offer satisfactory vision. New soft contact lens designs, customized hydrogel lenses, and pinhole soft contact lenses improve vision with soft lenses. Compared to corneal lenses, Toris K silicone hydrogel (SiHy) soft lenses are a successful option to treat KC (Amsler–Krumeich classification grades 1-4, mean keratometry 49.42D), with similar BCVA with the two lenses.²⁰ Customized hydrogel lenses with a pinhole included (Purecon, New Delhi) can also correct higher-order aberrations and vertical coma, improving vision in individuals with KC.²¹

Studies reviewed have reported that corneal lenses provided good comfort and were effective for the treatment of KC. The severity of KC typically determines the type of corneal lens fit. In mild-to-moderate KC, moncurve corneal lenses were most commonly fitted; in severe to advanced KC, bicurve corneal lenses were more frequently fitted.²² In advanced KC, corneal fitting may be difficult due to lens decentration, dislocation, or discomfort.

Both scleral and hybrid lenses offer good vision and comfort for individuals with KC, even for those intolerant to corneal lenses. Scleral lens advantages compared to corneal lenses are improved comfort and stable lens wear. Jupiter scleral lenses (15.0–24.0mm in diameter) improved vision and comfort (78%).²³ Prosthetic replacement of the ocular surface ecosystem (PROSE) custom lens wear improved NEI VFQ-25 score of 27.6 points and were an effective option for 88% of wearers at 6 months.²⁴

SoftPerm hybrid lenses demonstrated good vision.²⁵ However, these lenses were discontinued in 2010 due to complications, including poor tear exchange, corneal neovascularization, and lens tearing at the junction of the soft and rigid portions. Although not included in this article, Synergeyes,²⁶ Eyebrid²⁶⁻²⁹ and Airflex²⁶⁻²⁹ hybrid lenses have demonstrated improved vision and comfort in individuals with KC.

Contact lens application post-surgery

After CXL, corneal lens wear is well tolerated due to reduced corneal sensitivity and the flattening effect of the surgical treatment. The duration of scleral lens wear is stable in pre- and post-CXL. Contact lens fitting may be more difficult after ICRS implantation. Soft, scleral, and piggyback lenses provide good vision and function in the treatment of KC post-ICRS. Although in post-penetrating keratoplasty (PK), contact lens fitting may be challenging, it is necessary to correct recurrent disease or residual refractive error. Lens decentration and intolerance are common with corneal lenses. Newer designs of corneal and scleral lenses are effective in post-PK eyes. Jupiter scleral lenses (15.6–18.4mm diameter) improved vision compared to spectacle refraction or habitual contact lenses (most commonly corneal lenses) by two lines.³⁰ Most eyes (91.7%) achieved functional vision of 20/20 or better with Jupiter scleral lenses. Tricurve corneal lenses with a large diameter (12mm) were successfully fitted in 47% of individuals of 190 post-PK individuals.³¹

Assessing patient satisfaction

Satisfaction with contact lens wear and comfort are important factors that affect patient compliance. The relationship between KC severity and rigid contact lens comfort remains equivocal. Scores on the Contact Lens Impact on Quality of Life (CLIQ) Questionnaire were similar between corneal, hybrid, soft toric, and silicone hydrogel KC lenses for individuals with KC.^{32,33} Scleral lenses (17.0–18.2 mm) improved patient-reported satisfaction and comfort compared with habitual lenses (primarily corneal, also soft, piggyback, and hybrid lenses). A limitation in the assessment of the quality of life in KC contact lens wear is the absence of validated quality of life questionnaires specific to KC.

Contact lens complications

KC contact lens wear complications are associated with a variety of structural changes, such as decreased basal epithelial cell density, stromal keratocyte density, and endothelial cell density. KC was correlated with dry eye disease in a few studies; an elevated prevalence of clinical signs such as corneal staining and reduced tear break-up time, and a higher concentration of pro-inflammatory markers such as interleukins and metalloproteinases have been found in patients with KC.

The type and material of contact lenses affect the risk of infectious keratitis, a sight-threatening complication of contact lens wear. No evidence suggests that individuals with KC have an increased rate of infective keratitis compared to those wearing similar types of contact lenses.

Fitting techniques

Fitting techniques for KC lenses have expanded over time with innovative technologies. Corneal topography and tomography can simplify contact lens fitting. Scheimpflug imaging and anterior segment optical coherence tomography (AS-OCT) are helpful in scleral lens fitting. Spectral-domain AS-OCT can evaluate and measure the tear film thickness with various corneal lens fitting patterns. Additionally, computerized contact lens fitting can reduce fitting complexity, improve visual performance and reduce chair time. Customized impression-based technology may aid contact lens fitting in individuals with KC. In KC, a negative-powered soft contact lens provides a flatter anterior surface and may be more helpful when fitting piggyback contact lenses. Contact lenses continue to be an important and popular option for visual rehabilitation in KC, despite advances in the surgical treatment of KC. The available fitting options for individuals with KC have expanded with novel contact lens designs and materials.

Future topics of research include comparative studies of different types of contact lenses, validated quality-of-life questionnaires for KC, and comparative studies on the outcomes of modern KC surgical options to contact lenses.

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