



Brief report

A comparison of the visual acuity outcome between Clearkone and RGP lenses

Mohammadali Hassani ^a, Ebrahim Jafarzadehpour ^{b,*}, Ali Mirzajani ^b, AbbasAli Yekta ^c, Mehdi Khabazkhoob ^d

^a Noor Research Center for Ophthalmic Epidemiology, Noor Eye Hospital, Tehran, Iran

^b Department of Optometry, Iran University of Medical Sciences, Tehran, Iran

^c Refractive Errors Research Center, School of Paramedical Sciences, Mashhad University of Medical Sciences, Mashhad, Iran

^d Department of Medical Surgical Nursing, School of Nursing and Midwifery, Shahid Beheshti University of Medical Sciences, Tehran, Iran

Received 18 March 2017; revised 1 August 2017; accepted 7 August 2017

Available online 26 August 2017

Abstract

Purpose: To compare the visual acuity outcome of the ClearKone SynergEyes™ hybrid contact lens and Boston XO rigid gas permeable (RGP) contact lens in patients with keratoconus.

Methods: Twenty-eight eyes with keratoconus participated in this study. The visual acuity was examined once with the RGP lens and once with the ClearKone SynergEyes™ hybrid contact lens.

Results: The mean corneal keratometry, the mean lens back optic zone radius, and the mean vault was 7.23 ± 0.62 mm, 7.67 ± 0.44 mm, and 277.94 ± 104.5 μ m, respectively. Visual acuity was significantly better with the ClearKone SynergEyes™ hybrid lens ($P = 0.004$). The mean best corrected visual acuity (logMAR) was 0.022 ± 0.03 and 0.057 ± 0.09 for the ClearKone and RGP lens, respectively. The Clearkone lens yields an average improvement of one line of the Snellen chart in comparison with the RGP lens.

Conclusion: The ClearKone hybrid contact lens and the RGP lens may improve visual acuity in corneal irregularities. But patients who are able to afford hybrid lens wearing may show better visual acuity.

Copyright © 2018, Iranian Society of Ophthalmology. Production and hosting by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Keywords: ClearKone hybrid contact lens; Rigid gas permeable; Keratoconus; Irregular cornea

Introduction

Keratoconus causes severe changes in the visual performance, which is essential for quality of life and may be associated with visual acuity loss.^{1–3} Years ago, hard contact lenses were the best management modality for keratoconus.⁴ rigid gas permeable (RGP) contact lenses are the first option in the management of

keratoconus patients to rehabilitate their vision and improve their quality of life.⁵ In recent years, alternative options for fitting patients with advanced stages of keratoconus or patients who have failed with RGP contact lens design for keratoconus, such as hybrid or scleral contact lenses, have been proposed.^{6,7} Application of all criteria may not be possible, so a compromise between these factors can help to gain relative satisfaction.^{8,9} The aim of the present study was to compare visual acuity in keratoconus patients using ClearKone and RGP lenses.

Financial Support: This project was supported by Noor Research Center for Ophthalmic Epidemiology.

Conflict of Interest: No conflicting relationship exists for any author.

* Corresponding author. Department of Optometry, Iran University of Medical Sciences, Madar SQ, Mirdamad Avenue, Tehran, Iran.

E-mail address: jafarzadehpour.e@iums.ac.ir (E. Jafarzadehpour).

Peer review under responsibility of the Iranian Society of Ophthalmology.

Methods

The inclusion criteria were a diagnosis of keratoconus by an ophthalmologist, tear health, and achievement of optimal

contact lens fit with both RGP [Boston XO (Bausch & Lomb Inc, Rochester, NY, USA), three-point-touch was considered as the acceptable final fitting¹⁰] and Clearkone lenses.

In the next stage, fitting of the ClearKone started 30 min after removing the RGP lens, according to the standard fitting procedure. Visual acuity with two lenses was recorded separately.

Results

In this study, 28 eyes of 22 men and 6 women with a mean age of 34 ± 5.94 years (range, 24–46 years) were evaluated. Most of patients could not tolerate conventional RGP lenses as they were in stage three in Pentacam classification.

The descriptive statistics of the study are shown in Table 1.

Based on paired *t* test analysis, visual acuity was significantly better with the ClearKone hybrid lens ($P = 0.004$). The mean best corrected visual acuity (logMAR) was 0.022 ± 0.03 and 0.057 ± 0.09 for the ClearKone and RGP lens, respectively.

Discussion

RGP contact lenses were widely used as the best choice for management of corneal ectasia.¹¹ The visual acuity of the ClearKone contact lenses was better than the standard design of RGP lenses. However, Hashemi et al found no difference between the two groups,¹² but Carracedo et al showed that the visual acuity of the ClearKone lens was better than standard design of the RGP lenses.¹³ The authors reported that the reason for this difference was the severity of keratoconus. In sever to moderate ectasia, ClearKone lenses are more effective.¹³

Vertical corneal apex decentration is another factor that decreases the centration of the RGP lens and decreases the visual acuity.¹⁴

It is important to mention that flatter fitting of the RGP lens results in a better visual acuity,¹⁵ but it may be associated with corneal scarring.¹⁶ A three-point touch was the fitting reference in this study to avoid central corneal scar, but lens stability and visual acuity cannot be achieved in all patients. Moreover, the ClearKone lens utilizes a reverse geometry system that increases its performance.¹⁷

Previous studies have shown that RGP lenses provide a better visual acuity than scleral lenses¹⁸ due to the tear

retention under the lens. If the tear film is about 50 μm , it improves visual acuity, but more than 150 μm , it worsens the patient's visual acuity.¹⁹ Thus, the height of ClearKone lens is considered about 50 μm .^{13,20,21}

In conclusion, the ClearKone hybrid contact lens and the RGP lens may improve visual acuity in corneal irregularities.

References

1. Kymes SM, Walline JJ, Zadnik K, Sterling J, Gordon MO. Changes in the quality-of-life of people with keratoconus. *Am J Ophthalmol.* 2008; 145(4):611–617.
2. Vega-Estrada A, Alio JL, Brenner LF, et al. Outcome analysis of intra-corneal ring segments for the treatment of keratoconus based on visual, refractive, and aberrometric impairment. *Am J Ophthalmol.* 2013;155(3): 575–584.
3. Lipson MJ, Musch DC. Synergeyes versus soft toric lenses: vision-related quality of life. *Optom Vis Sci.* 2007;84(7):593–597.
4. Edrington TB, Szczotka LB, Barr JT, et al. Rigid contact lens fitting relationships in keratoconus. Collaborative longitudinal evaluation of keratoconus (CLEK) study group. *Optom Vis Sci.* 1999;76(10):692–699.
5. Mandathara PS, Stapleton FJ, Willcox MDP. Outcome of keratoconus management: review of the past 20 years' contemporary treatment modalities. *Eye Contact Lens.* 2017;43(3):141–154.
6. 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(3):286–292.
7. Barnett M, Mannis MJ. Contact lenses in the management of keratoconus. *Cornea.* 2011;30(12):1510–1516.
8. Maguen E, Caroline P, Rosner IR, Macy JI, Nesburn AB. The use of the SoftPerm lens for the correction of irregular astigmatism. *CLAO J.* 1992; 18(3):173–176.
9. Apey DA, Barr JT. Corneal response and vision with the Softperm lens in simulated aircraft conditions. *J Am Optom Assoc.* 1996;67(3):151–159.
10. Leung KK. RGP fitting philosophies for keratoconus. *Clin Exp Optom.* 1999;82(6):230–235.
11. Rathi VM, Mandathara PS, Dumpati S. Contact lens in keratoconus. *Indian J Ophthalmol.* 2013;61(8):410–415.
12. Hashemi H, Shaygan N, Asgari S, Rezvan F, Asgari S. ClearKone-synergeyes or rigid gas-permeable contact lens in keratoconic patients: a clinical decision. *Eye Contact Lens.* 2014;40(2):95–98.
13. Carracedo G, González-Méjome JM, Lopes-Ferreira D, Carballo J, Batres L. Clinical performance of a new hybrid contact lens for keratoconus. *Eye Contact Lens.* 2014;40(1):2–6.
14. Downie LE. Predictive value of corneal topography for ClearKone hybrid contact lenses. *Optom Vis Sci.* 2013;90(7):e191–e197.
15. Krachmer JH, Feder RS, Belin MW. Keratoconus and related noninflammatory corneal thinning disorders. *Surv Ophthalmol.* 1984;28(4): 293–322.
16. Barr JT, Wilson BS, Gordon MO, et al. Estimation of the incidence and factors predictive of corneal scarring in the collaborative longitudinal evaluation of keratoconus (CLEK) study. *Cornea.* 2006;25(1):16–25.
17. Pilskalns B, Fink BA, Hill RM. Oxygen demands with hybrid contact lenses. *Optom Vis Sci.* 2007;84(4):334–342.
18. Pullum KW, Buckley RJ. A study of 530 patients referred for rigid gas permeable scleral contact lens assessment. *Cornea.* 1997;16(6):612–622.
19. Romero-Jiménez M, Flores-Rodríguez P. Utility of a semi-scleral contact lens design in the management of the irregular cornea. *Contact Lens Anterior Eye.* 2013;36(3):146–150.
20. Abdalla YF, Elsahn AF, Hammersmith KM, Cohen EJ. Synergeyes lenses for keratoconus. *Cornea.* 2010;29(1):5–8.
21. Nau AC. A comparison of synergeyes versus traditional rigid gas permeable lens designs for patients with irregular corneas. *Eye Contact Lens Sci Clin Pract.* 2008;34(4):198–200.

Table 1
Descriptive statistics of the study patients.

	Min	Max	Mean	Std Deviation	Mode
Flat K	6.55	9.37	7.57	0.612	7.45
Steep K	5.95	8.56	6.89	0.643	6.70
Mean K	6.25	8.97	7.23	0.626	7.17
BOZR	6.50	8.40	7.67	0.44	7.80
Vault	150	600	277.94	104.585	250
RGP VA (logMAR)	0	0.4	0.057	0.098	0
ClearKone VA (logMAR)	0	0.1	0.022	0.039	0

VA: Visual acuity, K: Keratometry, RGP: Rigid gas permeable, BOZR: Back optic zone radius.