• Clinical Research •

Efficacy of long-term orthokeratology treatment in children with anisometropic myopia

Kai–Yun Zhang[1,2,3], *Hui–Bin Lyu*[1,3], *Jia–Rui Yang*[1,3], *Wei–Qiang Qiu*[1,3]

[1]Department of Ophthalmology, Peking University Third Hospital, Beijing 100191, China
[2]College of Optometry, Peking University Health Science Center, Beijing100191, China
[3]Beijing Key Laboratory of Restoration of Damaged Ocular Nerve, Peking University Third Hospital, Beijing 100191, China
Co-first Authors: Kai-Yun Zhang and Hui-Bin Lyu
Correspondence to: Wei-Qiang Qiu. Department of Ophthalmology, Beijing Key Laboratory of Restoration of Damaged Ocular Nerve, Peking University Third Hospital, No.49, Garden North Road, Haidian District, Beijing 100191, China. lordq@163.com
Received: 2021-04-16 Accepted: 2021-06-10

Abstract
● **AIM:** To explore the efficacy of the orthokeratology lens for anisometropic myopia progression.
● **METHODS:** A retrospective study was performed. Cycloplegic refraction and axial length (AL) were collected from 50 children (10.52±1.72y) who visited Peking University Third Hospital from July 2015 to August 2020. These children's one eyes (Group A) received monocular orthokeratology lenses at first, after different durations (12.20±6.94mo), their contralateral eyes (Group B) developed myopia and receive orthokeratology as well. The data in 1-year of binocular period were recorded. AL growth rate (difference of follow-up and baseline per month) were compared between two groups by paired *t* test. Interocular differences of AL were compared by Wilcoxon test.
● **RESULTS:** During monocular period, the AL growth rate of the Group A (0.008±0.022 mm/mo) was significantly slower than that of the Group B (0.038±0.018 mm/mo; $P<0.0001$). However, during binocular period, the AL growth rate of the Group A (0.026±0.014 mm/mo) was significantly faster than that of the Group B (0.016±0.015 mm/mo; $P<0.0001$). The AL difference between both eyes was 0.6 (0.46) mm, then significantly decreased to 0.22 (0.39) mm when started binocular treatment ($P<0.0001$). However, it was significantly increased to 0.30 (0.32) mm after a year ($P<0.0001$), but still significantly lower than baseline ($P<0.0001$).
● **CONCLUSION:** The orthokeratology lens is efficient for control the AL elongation of monocular myopia eyes and reduce anisometropia. For the condition that the contralateral eyes develop myopia and receive orthokeratology lens later, there is no efficiency observed on control interocular difference of AL during binocular treatment.
● **KEYWORDS:** orthokeratology; anisometropia; myopia; axial length; children
DOI:10.18240/ijo.2022.01.17

Citation: Zhang KY, Lyu HB, Yang JR, Qiu WQ. Efficacy of long-term orthokeratology treatment in children with anisometropic myopia. *Int J Ophthalmol* 2022;15(1):113-118

INTRODUCTION

Anisometropia is defined as the interocular difference of refraction. Anisometropia tends to occur over the course of a life span, namely, after birth, at the onset of myopia, and at the onset of presbyopia[1]. Among school-aged children, the prevalence of anisometropia with a spherical equivalent refraction (SER) >0.5 diopter (D) is 34%, and it is 1%-10% when SER >1 D[2-6]. Also, the prevalence of myopic anisometropia is significantly higher than that of emmetropic anisometropia[3,7]. Both the prevalence and severity of anisometropia increase with increasing degree of myopia[8-9]. Binocular vision can be impaired even with moderate refractive differences between eyes, including stereoacuity and contrast sensitivity[10-12]. Anisometropia is thought to be closely related to aniseikonia and amblyopia[1,13]. Without intervention, the difference between the two eyes will continue to increase in both mild and severe anisometropia among school-aged children[14-16]. Thus, treating myopia and anisometropia at same time is seriously important.

An overnight orthokeratology (ortho-k) lens flattens the cornea by reverse geometry, which corrects the refractive error and provides clear vision during the daytime. Moreover, the ortho-k lens has been proven to be efficient in reducing myopia progression by nearly 45%[17], especially in patients with a higher degree of myopia[18-19]. Although there is a risk of microbial keratitis, ortho-k lenses are thought to be a safe clinical option[20].

Few studies have explored the effectiveness of ortho-k lenses under certain circumstance. For example, in some children, after monocular ortho-k treatment, contralateral emmetropic eye develop myopia, too. Children with anisometropic myopia receive ortho-k treatment in the sequence of monocular and binocular. Our study was aim to analyze whether the ortho-k lens effect on the control of axial anisometropic myopia, especially the condition mentioned above. This study will contralaterally compare the axial length (AL) elongation characteristic under monocular and binocular ortho-k treatment, and find if there is an ocular parameter that related with the AL elongation of the eye myopic later.

SUBJECTS AND METHODS

Ethical Approval This study was in accordance with the ethical standards formulated in the Helsinki Declaration. All subjects signed an informed consent before treatment.

Subjects This retrospective cohort study included children who visited Peking University Third Hospital for refraction correction from July 2015 to August 2020. Subjects met the following inclusion criteria: aged between 8-18y; monocular best corrected visual acuity not worse than 20/20 for both eyes; one eye with myopia (SER ≤-1.0 D) received ortho-k lens; the other eye being relatively emmetropic (SER <±0.5 D); after sometime of monocular ortho-k lens, the contralateral eye developed myopia (SER ≤-1.0 D) too and began binocular ortho-k lens treatment. And the exclusion criteria are: astigmatism ≥2.0 D; history of corneal contact lens; history of atropine drops; eye disease or surgery; discontinuation of ortho-k lens use; ocular or systemic conditions that might affect.

Materials The ortho-k lenses used in this study were Paragon CRT lenses (Paragon Vision Sciences, USA) and LK lenses (Lucid, Korea). Ortho-k lenses were fitted to every subject according to the manufacturer's recommended procedure. Lenses were selected by experienced optometrists based on corneal topographic variables and adjusted under sodium fluorescein and cobalt blue lighting. After treatment began, each subject was told to wear a lens overnight for approximately 8h and visit the hospital regularly and whenever ocular complaints occurred.

Measurement and Technique All the subjects received baseline examinations, including autorefraction (RM 8800, Topcon, Japan), cycloplegic refraction (compound tropicamide eye drops, Sinqi, China), AL measurement (IOLMaster-500, Carl Zeiss, Germany), and corneal topography (Pentacam HR; Oculus, Germany). After no less than 3mo of treatment, the AL and corneal topography were evaluated at every 3mo or anytime subjects wanted.

Data Analysis Continuous variables are expressed as the means±standard deviation or median (interquartile range). Multiple linear regression was used to estimate the relationship between several independent ocular variables and the AL growth rate of emmetropic eyes at monocular period. The baseline characteristics and the average elongation of AL per month were evaluated by paired t test. The comparation for interocular differences of AL were evaluated by Wilcoxon test. Statistical analysis was performed using the SPSS software package (SPSS for Windows, version 24, Chicago, IL, USA). The level of statistical significance was considered to be 0.05 (two-sided).

RESULTS

General Results A total of 50 children participated in this observation, 18 of whom were boys and 32 of whom were girls. The average age was 10.52±1.72y. At baseline, they only had one myopic eye (SER -1.80±0.82 D), and were applied with ortho-k lenses. The degree of SER anisometropia was 1.56±0.97 D (95%CI: 1.29, 1.84) at baseline. After different durations of monocular treatment, 12.20±6.94mo (95%CI: 10.23, 14.17), the contralateral eyes of these children developed myopia (SER -1.56±0.43 D) and applied with ortho-k lens, too. Then the patients started binocular ortho-k treatment.

For convenience, the eye that received the ortho-k lens first was regarded as Group A, and the other eye which received the ortho-k lens later was regarded as Group B. The AL and SER of the two groups of eyes at the baseline and endpoint of monocular period are shown in Table 1.

During the whole treatment, there were no serious adverse events among these subjects.

Factors Corelated with the Axial Length Growth of the Untreated Eyes The average elongation of the AL per month (mm/mo) was calculated as the AL growth rate, as well as the difference of follow-up and baseline AL (mm) divided by duration (mo). In monocular period, the AL growth rate of Group B, untreated eyes, is 0.038±0.018 mm/mo (95%CI: 0.033, 0.044). To explore the relationships, nine baseline factors were taken, including age, SER, mean corneal curvature (Km), anterior chamber depth (ACD), and AL of both eyes. In the multiple linear regression analysis, it was independent of observations (Durbin-Watson=1.901), and there was no multicollinearity. This regression model was statistically significant (F=3.879, P=0.001, adjusted R^2=0.346). As shown in Table 2, among these factors, age (P=0.005; B: -0.004; 95%CI: -0.007, -0.001), SER of Group A (P=0.03; B: 0.013; 95%CI: 0.001, 0.024), AL of Group A (P=0.006; B: 0.032; 95%CI: 0.01, 0.055), and AL of Group B (P=0.011; B: -0.035; 95%CI: -0.062, -0.009) were statistically significant.

Compare Axial Length Growth Rates Between Two Periods In order to explore the differences of AL changes between monocular and binocular periods, the AL of 12±1mo after beginning binocular ortho-k treatment was measured. The

Table 1 Characteristics at baseline and endpoint of monocular ortho-k treatment

Parameters	Group A	Group B	*t*	*P*
SER (D)	-1.80±0.82 (-2.05, -1.55)	-0.29±0.56 (-0.45, -0.14)	-10.725	<0.0001
SER[a] (D)	-	-1.56±0.43 (-1.69, -1.44)	-	-
AL (mm)	24.53±0.78 (24.31, 24.75)	23.90±0.77 (23.68, 24.12)	10.356	<0.0001
AL[a] (mm)	24.64±0.78 (24.41, 24.86)	24.34±0.72 (24.13, 24.54)	5.619	<0.0001

Group A: The eyes received the ortho-k lens at first; Group B: The contralateral eyes; SER: Spherical equivalent refraction; AL: Axial length. [a]The endpoint of monocular treatment.

Table 2 Associations (multiple analysis) between the ocular parameters and axial growth rate of emmetropic eyes in monocular ortho-k period

Parameters	*P*	Standardized coefficient *B*	Unstandardized coefficients *B*	95%CI for *B*
Age	0.005[b]	-0.406	-0.004	-0.007, -0.001
Group A				
SER	0.030[a]	0.617	0.013	0.001, 0.024
Km	0.461	0.433	0.005	-0.009, 0.019
ACD	0.541	-0.209	-0.022	-0.095, 0.05
AL	0.006[b]	1.416	0.032	0.01, 0.055
Group B				
SER	0.539	-0.096	-0.004	-0.015, 0.008
Km	0.784	-0.163	-0.002	-0.015, 0.011
ACD	0.326	0.321	0.035	-0.036, 0.105
AL	0.011[a]	-1.511	-0.035	-0.062, -0.009

Group A: The eyes received the ortho-k lens first; Group B: The contralateral eyes; SER: Spherical equivalent refraction; Km: Mean corneal curvature; ACD: Anterior chamber depth; AL: Axial length.

Table 3 AL growing rate compared by *t* test

Parameters	*n*	Group A	Group B	*t*	*P*
Monocular period	50	0.008±0.022 (0.002, 0.014)	0.038±0.018 (0.033, 0.044)	-8.251	<0.0001
Binocular period	50	0.026±0.014 (0.022, 0.030)	0.016±0.015 (0.012, 0.021)	4.675	<0.0001
t	-	-4.664	7.826	-	-
P	-	<0.0001	<0.0001	-	-

Group A: The eyes received the ortho-k lens first; Group B: The eyes that received the ortho-k lens later; Monocular period: The monocular ortho-k lens treatment; Binocular period: The binocular ortho-k lens treatment.

AL was 24.89±0.76 mm (95%CI: 24.68, 25.11) of Group A, and 24.51±0.71 mm (95%CI: 24.31, 24.72) of Group B. The AL growth rates per month were shown in Table 3, the paired *t* test was conducted. For the Group A, the AL growth rate was significantly lower in monocular period (0.008±0.022 mm/mo) than in binocular period (0.026±0.014 mm/mo; *t*=-4.664, *P*<0.0001). For the Group B, the AL growth rate was significantly higher in monocular period (0.038±0.018 mm/mo) than in binocular period (0.016±0.015 mm/mo; *t* =7.826, *P*<0.0001).

Compare Axial Length Growth Rates Between Two Eyes The results are also shown in Table 3. As in Figure 1, during monocular period, the AL growth rate of the Group A (0.008±0.022 mm/mo) was significantly slower than that of the Group B (0.038±0.018 mm/mo; *t*=-8.251, *P*<0.0001). However, during binocular period, the AL growth rate of the Group A (0.026±0.014 mm/mo) was significantly faster than that of the Group B (0.016±0.015 mm/mo; *t*=4.675, *P*<0.0001).

Compare Changes in Anisometropia of Axial Length The intraocular differences of AL were non-normally distributed. At beginning, it was 0.6 (0.46) mm. After monocular ortho-k treatment, it was significantly decreased to 0.22 (0.39) mm (*Z*=-5.402, *P*<0.0001). However, after a year around binocular ortho-k treatment, it was significantly increased to 0.30 (0.32) mm (*Z*=-4.086, *P*<0.0001), but still significantly lower than baseline (*Z*=-4.716, *P*<0.0001; Table 4).

DISCUSSION

Anisometropia is a special form of refractive error that is

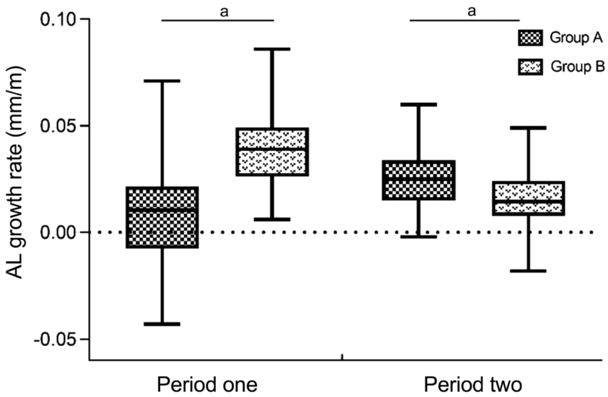

Figure 1 Axial length growth rate of both eye groups Group A: The eyes received the ortho-k lens first; Group B: The eyes that received the ortho-k lens later; Monocular period: The monocular ortho-k lens treatment; Binocular period: The binocular ortho-k lens treatment. Box and whiskers were shown in min and max. Statistical significance was assessed using paired *t* test ([a]$P<0.0001$).

Table 4 Intraocular differences of axial length

Paremeters	Intraocular difference of axial length (mm)	*Z*	*P*
Initial	0.60 (0.46)	-5.402[a]	<0.0001
Intermediate	0.22 (0.39)	-4.086[b]	<0.0001
Final	0.30 (0.32)	-4.716[c]	<0.0001

Initial: The baseline of monocular ortho-k treatment; Intermediate: The endpoint of monocular treatment; Final: The endpoint of binocular treatment. [a]Initial *vs* intermediate; [b]Intermediate *vs* final; [c]Initial *vs* final. Data were represented in median (interquartile range). Statistical significance was assessed using Wilcoxon test.

defined as refractive differences between two eyes that are spherical, cylindric or both, but the criterion for anisometropia varies among studies from 0.5 to 1.5 D[6,14,21-22]. Since the ortho-k lens only applied to SER≤-1.0 D, subjects in this study had anisometropia no less than SER 0.5 D, and the degree of anisometropia was SER 1.56±0.97 D at baseline. Although optical components such as corneal curvature, refraction of the crystalline lens, and AL all contribute to ocular refraction, AL is considered to be fundamental in creating interocular refraction differences[3,14]. Thus, this study was to observe progression of axial anisometropia under ortho-k lens.

The multiple analysis between the parameters and axial growth rate of Group B in monocular period showed significant relation (*P*=0.001). Beside age (*P*=0.005), AL of Group A and Group B (*P*=0.006, *P*=0.011) were significantly related to axial growth rate before developing myopia. This is in accordance with previous studies showing that myopia progression varies with AL elongation, besides age growth[23-24]. And SER of Group A showed significant, too (*P*=0.03). Which may suggest that the higher refractive error, the faster growth of the contralateral eye.

During the monocular ortho-k lens period, the AL of the myopic eyes was prolonged by 0.008±0.022 mm/mo, compared to 0.038±0.018 mm/mo in the contralateral untreated eyes. Also, the interocular difference in AL was significantly smaller than that at baseline (*P*<0.0001).

Some similar studies also investigated the change in anisometropia with monocular ortho-k lens. Cheung *et al*[25] described a case in which the AL of the eye fitted with an ortho-k lens increased 0.13 mm, while that of the other eye without vision correction increased by 0.34 mm over two years. Chen and Dai[26] observed 56 adolescents with unilateral ortho-k lens for one year. The AL was increased by 0.14±0.10 mm and 0.32±0.14 mm in eyes with and without ortho-k lenses, respectively. Tsai *et al*[27] demonstrated that after 2y of ortho-k treatment in unilateral myopic children, the AL interocular difference (the authors named as aniso-AL) decreased from 0.83±0.45 to 0.59±0.49 mm. Na and Yoo[28] observed 45 children with monocular ortho-k lenses for one year, and the AL increase in myopic eyes (0.07±0.21 mm) was smaller than that in nonmyopic eyes (0.36±0.23 mm). Therefore, it has been confirmed that the ortho-k lens is efficient in diminishing interocular differences in monocular myopia.

It is considered that a greater baseline SER is related to a smaller AL elongation under ortho-k treatment[29-30]. Lum[31] described a case report of an Asian boy with progressive myopic anisometropia, where the aniso-AL increased from 0.76 to 0.91 mm before treatment but decreased to 0.84 mm after the same period of binocular ortho-k treatment. Long *et al*[32] observed 98 anisometropic children fitted with binocular ortho-k lenses, and the aniso-AL decreased by 0.10±0.15 mm after one year. Zhang and Chen[33] also found that the aniso-AL decreased from 0.72±0.34 to 0.56±0.38 mm after 2y of binocular ortho-k treatment in 49 children. However, Fu *et al*[34] reported another outcome from 25 anisometropic children with a one-year binocular ortho-k lenses. The elongation of the low myopic eyes (0.13±0.16 mm) showed no significant difference from that of the high myopic eyes (0.09±0.14 mm, *P*=0.36). They found that both eyes grew at the same rate and that the degree of anisometropia did not decrease.

In our study, after Group B (-0.29±0.56 D) developed myopia (-1.56±0.43 D), subjects received binocular ortho-k treatment. At the beginning of binocular period, although the true SER of Group A was difficult to measure, the AL of Group A (24.64±0.78 mm) was still significantly longer than the AL of Group B (24.34±0.722 mm; *P*<0.0001). During binocular period, the AL elongation of the Group B was 0.016±0.015 mm/mo, while that of the Group A was 0.026±0.014 mm/mo. Contrary to the expectation that the effect of ortho-k on myopia progression was dose-dependent, the Group A were longer than the Group B (*P*<0.0001). The reason might be that the functionality of the ortho-k lenses was reduced during usage and needs to be replaced. The peripheral myopia defocus generated by ortho-k treatment is considered to be a fatal signal in slowing myopia progression[35]. When the AL lengthens, the visual signal on the retina may change, and the power of the ortho-k lens may decline. During binocular period, the Group A still fit with the old lenses, which may cause the control of myopia progression to be reduced. The AL growth rate of Group A between the two periods was also compared; monocular period (0.008±0.022 mm) was smaller than binocular period (0.026±0.014 mm), which suggested that the ortho-k lenses were worn out. In addition, the aniso-AL in final timing 0.30 (0.32) mm was significantly higher than that in intermediate timing 0.22 (0.39) mm (*P*<0.0001), but still significantly lower than initial one 0.60 (0.46) mm (*P*<0.0001). In other words, after the other eyes also developed myopia, just fitting these eyes with ortho-k lenses maybe not enough to treat axial anisometropia. The old lenses might need to be replaced.

There are some limitations in the current study. First, although criteria were used to enroll subjects, data on some factors that may influence myopia progression, such as ethnic group, genetic differences, environmental differences, daily activities, and time spent outdoors, were not recorded. Second, the different durations of the untreated eyes developing myopia makes it difficult to compare the AL directly, thus we analyzed the growth per month, which may interfere the results. In the future, more well-designed prospective studies are needed.

In conclusion, the ortho-k lens is efficient for control progression of anisometropic myopia, because of inhibiting the AL elongation of monocular myopia eyes. For the condition that the contralateral eyes develop myopia and receive ortho-k lens later, there is no efficiency observed on control interocular difference of AL during binocular treatment. This study may suggest doctors to use ortho-k lens to treat monocular myopia children, and pay attention to the contralateral eyes of children with higher myopia or longer AL.

ACKNOWLEDGEMENTS

Foundations: Supported by China International Medical Foundation (No.Z-2018-40); Beijing Municipal Science and Technology Commission (No.Z151100004015073).

Conflicts of Interest: Zhang KY, None; **Lyu HB,** None; **Yang JR,** None; **Qiu WQ,** None.

REFERENCES

1 Barrett BT, Bradley A, Candy TR. The relationship between anisometropia and amblyopia. *Prog Retin Eye Res* 2013;36:120-158.

2 Deng L, Gwiazda JE. Anisometropia in children from infancy to 15 years. *Invest Ophthalmol Vis Sci* 2012;53(7):3782-3787.

3 Pärssinen O, Kauppinen M. Anisometropia of spherical equivalent and astigmatism among myopes: a 23-year follow-up study of prevalence and changes from childhood to adulthood. *Acta Ophthalmol* 2017;95(5):518-524.

4 Larsson E, Holmström G, Rydberg A. Ophthalmological findings in 10-year-old full-term children—a population-based study. *Acta Ophthalmol* 2015;93(2):192-198.

5 Hu YY, Wu JF, Lu TL, Wu H, Sun W, Guo DD, Jiang WJ, Wang XR, Jonas JB, Bi HS. Prevalence and associations of anisometropia in children. *Invest Ophthalmol Vis Sci* 2016;57(3):979-988.

6 Tong L, Saw SM, Chia KS, Tan D. Anisometropia in Singapore school children. *Am J Ophthalmol* 2004;137(3):474-479.

7 Edwards MH. The development of myopia in Hong Kong children between the ages of 7 and 12 years: a five-year longitudinal study. *Ophthalmic Physiol Opt* 1999;19(4):286-294.

8 Guzowski M, Fraser-Bell S, Rochtchina E, Wang JJ, Mitchell P. Asymmetric refraction in an older population: the Blue Mountains Eye Study. *Am J Ophthalmol* 2003;136(3):551-553.

9 Qin XJ, Margrain TH, To CH, Bromham N, Guggenheim JA. Anisometropia is independently associated with both spherical and cylindrical ametropia. *Invest Ophthalmol Vis Sci* 2005;46(11):4024-4031.

10 Levi DM, McKee SP, Movshon JA. Visual deficits in anisometropia. *Vis Res* 2011;51(1):48-57.

11 Chen BB, Song FW, Sun ZH, Yang Y. Anisometropia magnitude and visual deficits in previously untreated anisometropic amblyopia. *Int J Ophthalmol* 2013;6(5):606-610.

12 Gawęcki M. Threshold values of myopic anisometropia causing loss of stereopsis. *J Ophthalmol* 2019;2019:2654170.

13 Krarup TG, Nisted I, Christensen U, Kiilgaard JF, la Cour M. The tolerance of anisometropia. *Acta Ophthalmol* 2020;98(4):418-426.

14 Deng L, Gwiazda J, Manny RE, Scheiman M, Weissberg E, Fern KD, Weise K, COMET Study Group. Limited change in anisometropia and aniso-axial length over 13 years in myopic children enrolled in the Correction of Myopia Evaluation Trial. *Invest Ophthalmol Vis Sci* 2014;55(4):2097-2105.

15 Zedan RH, El-Fayoumi D, Awadein A. Progression of high anisometropia in children. *J Pediatr Ophthalmol Strabismus* 2017;54(5):282-286.

16 Xiao O, Morgan IG, Ellwein LB, He MG, Refractive Error Study in Children Study Group. Prevalence of amblyopia in school-aged children and variations by age, gender, and ethnicity in a multi-country refractive error study. *Ophthalmology* 2015;122(9):1924-1931.

17 Sun Y, Xu F, Zhang T, Liu ML, Wang DY, Chen YL, Liu Q. Orthokeratology to control myopia progression: a meta-analysis. *PLoS One* 2015;10(4):e0124535.

18 Li SM, Kang MT, Wu SS, Liu LR, Li H, Chen Z, Wang NL. Efficacy, safety and acceptability of orthokeratology on slowing axial elongation in myopic children by meta-analysis. *Curr Eye Res* 2016;41(5):600-608.

19 He MM, Du YR, Liu QY, Ren CD, Liu JL, Wang QY, Li L, Yu J. Effects of orthokeratology on the progression of low to moderate myopia in Chinese children. *BMC Ophthalmol* 2016;16:126.

20 Liu YM, Xie PY. The safety of orthokeratology—A systematic review. *Eye Contact Lens* 2016;42(1):35-42.

21 Cheng F, Shan L, Song WL, Fan P, Zhang LJ, Wang XY, Yuan HP. Prevalence and risk factor for refractive error in rural Chinese adults in Kailu, Inner Mongolia. *Ophthalmic Physiol Opt* 2021;41(1):13-20.

22 Tsai WS, Wang JH, Chiu CJ. A comparative study of orthokeratology and low-dose atropine for the treatment of anisomyopia in children. *Sci Rep* 2020;10(1):14176.

23 Verkicharla PK, Kammari P, Das AV. Myopia progression varies with age and severity of myopia. *PLoS One* 2020;15(11):e0241759.

24 Tao ZY, Deng HW, Zhong HH, Yu Y, Zhao J, Chen SQ, Li S, Zhu MJ. A longitudinal study of the effect of ocular biometrics measures on myopia onset. *Graefes Arch Clin Exp Ophthalmol* 2021;259(4):999-1008.

25 Cheung SW, Cho P, Fan D. Asymmetrical increase in axial length in the two eyes of a monocular orthokeratology patient. *Optom Vis Sci* 2004;81(9):653-656.

26 Chen XH, Dai Y. Clinical observation of orthokeratology controlling monocular myopia in adolescents. *Guoji Yanke Zazhi (Int Eye Sci)* 2019;19(3):517-519.

27 Tsai WS, Wang JH, Lee YC, Chiu CJ. Assessing the change of anisometropia in unilateral myopic children receiving monocular orthokeratology treatment. *Taiwan Yi Zhi* 2019;118(7):1122-1128.

28 Na MR, Yoo A. The effect of orthokeratology on axial length elongation in children with myopia: contralateral comparison study. *Jpn J Ophthalmol* 2018;62(3):327-334.

29 Wang B, Naidu RK, Qu X. Factors related to axial length elongation and myopia progression in orthokeratology practice. *PLoS One* 2017;12(4):e0175913.

30 Fu AC, Chen XL, Lv Y, Wang SL, Shang LN, Li XH, Zhu Y. Higher spherical equivalent refractive errors is associated with slower axial elongation wearing orthokeratology. *Cont Lens Anterior Eye* 2016;39(1):62-66.

31 Lum E. Progressive anisometropia and orthokeratology: a case report. *Clin Exp Optom* 2018;101(4):599-600.

32 Long W, Li ZY, Hu Y, Cui DM, Zhai Z, Yang X. Pattern of axial length growth in children myopic anisometropes with orthokeratology treatment. *Curr Eye Res* 2020;45(7):834-838.

33 Zhang Y, Chen Y. Effect of orthokeratology on axial length elongation in anisomyopic children. *Optom Vis Sci* 2019;96(1):43-47.

34 Fu AC, Qin J, Rong JB, Ji N, Wang WQ, Zhao BX, Lyu Y. Effects of orthokeratology lens on axial length elongation in unilateral myopia and bilateral myopia with anisometropia children. *Cont Lens Anterior Eye* 2020;43(1):73-77.

35 Queirós A, González-Méijome JM, Jorge J, Villa-Collar C, Gutiérrez AR. Peripheral refraction in myopic patients after orthokeratology. *Optom Vis Sci* 2010;87(5):323-329.