Contact Lens & Anterior Eye 37 (2014) 116–119

Contents lists available at ScienceDirect

Contact Lens & Anterior Eye

journal homepage: www.elsevier.com/locate/clae

Case report

Orthokeratology for slowing myopic progression in a pair of identical twins

Ka Yin Chan*, Sin Wan Cheung, Pauline Cho

School of Optometry, The Hong Kong Polytechnic University, Kowloon, Hong Kong

ARTICLE INFO

Article history:
Received 18 June 2013
Received in revised form 27 August 2013
Accepted 16 September 2013

Keywords:
Orthokeratology
Twins
Myopic control
Axial length
Refractive errors

ABSTRACT

Purpose: To compare the axial length elongation and change in refractive errors in a pair of identical twins wearing orthokeratology (ortho-k) and single vision lenses (SVLs), respectively.
Case report: Identical Twin A and B, who were 8 years of age, with the same amount of near activities, were assigned to wear ortho-k and SVLs randomly and they were monitored for two years for myopic progression. Twin A and B were assigned to wear ortho-k and SVLs, respectively. Myopic progression was evaluated by the change in axial length and in refractive errors. A faster axial length elongation was observed in each eye of Twin B during the two-year study period. The overall change in axial length was 0.52 mm (OD) and 0.70 (OS) in Twin A and 0.77 mm (OD) and 0.82 mm (OS) in Twin B. In terms of cycloplegic refractive errors (SER), one month after ceasing lens wear (after completion of the two-year study), the increase (from baseline) were 11% (OD) and 48% (OS) in Twin A and 87% (OD) and 67% (OS) in Twin B.
Conclusions: Ortho-k is more effective in controlling myopic progression in terms of axial elongation than wearing SVLs in this pair of identical twins.

1. Introduction

Overnight orthokeratology (ortho-k) has been shown to be able to correct low to moderate myopia and to retard myopic progression in children by 32%–55% [1–6]. It is becoming popular in countries where the prevalence of myopia is high like Hong Kong [7]. Clinical results of the early longitudinal studies [1–5] have shown the potential of ortho-k to slow axial elongation and a recent randomized clinical trial has confirmed the effectiveness of ortho-k for myopic control in children [6]. However, variability was found in the response to ortho-k treatment among subjects, indicating that there are other factors affecting the response, e.g. visual habits, environmental factor. The limitations and the confounding factors may affect the effect of ortho-k on myopic control. A case report of a pair of identical twins may give some insight of ortho-k on myopic control with these confounding factors minimized. In this report, the data of a pair of identical twins who were randomly assigned to wear ortho-k and single vision lenses (SVLs) for vision correction in a 2-year myopic control study were compared and presented.

2. Case report

The twins were eight years old when they enrolled in the myopic control study. At the baseline examination, both of them fulfilled the inclusion criteria of the myopic control study [6]. The twins were randomly assigned to wear ortho-k lenses (Twin A) and SVLs (Twin B) and were monitored for 24 months. Ethics approval for the project was obtained from the Departmental Research Committee of the School of Optometry, The Hong Kong Polytechnic University, and all the procedures in the study followed the tenets of Declaration of Helsinki in 2002. Informed consent was obtained from the subjects and their parent prior to the commencement of the study. Neither of them had worn contact lenses or had any myopic control treatment before. The twins have a family history of high myopia (−10 D for mother). Both of them attended the same class of the same school and spent equal time on extra-curricular activities. The two subjects were studying at primary school during the study period. School started early in the morning and finished after three o'clock in the afternoon and went to tutorial class right afterwards. They returned home usually after dark in the school day.

An insertion and removal training was arranged for Twin A after the randomization for the myopic control study. The performance of lens handling of both the subject and the parent was reviewed by a practitioner. Ortho-k lenses were ordered and delivered only after the practitioner was satisfied with their performance on lens handling. The ortho-k lenses fitted on Twin A was Menicon Z Night

* Corresponding author. Tel.: +852 2766 4462; fax: +852 2367 7152.
E-mail addresses: kayin.chan@connect.polyu.hk, dedeforsure@gmail.com (K.Y. Chan).

1367-0484/$ – see front matter © 2013 British Contact Lens Association. Published by Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.clae.2013.09.007

Table 1
Contact lens solutions and accessories delivered to Twin A.

	Solution	Replacement frequency	Remarks
Cleaner	O_2 Care Daily Cleaner	Every 2 months	Rub each lens surface for 10 s
Soaking	MeniCare Plus	Every month	–
Rinsing	Bausch + Lomb Saline	Every month	Rub and rinse lens before insertion and after cleaning with cleaner
Enzymatic cleaner	Menicon Progent	–	Perform once a week after cleaning lenses as per routine
Artificial tears	Uni-dose Alcon Tears Naturale Free	–	For lens insertion and also before lens removal
Menicon cylindrical case	–	Replace with every new bottle of MeniCare Plus solution	Pour away MeniCare Plus; rinse and fill to the mark with fresh soaking solution after lens insertion, Store in a cool, dry place
Menicon SP vial	–	Annually	Clean vial after use; air dry and store in a cool, dry place

Table 2
Cycloplegic spherical equivalent refraction (SER) and LogMAR visual acuity (VA) of the twins in the baseline, 24- and 25-month visits. (Twin A – orthokeratology (*residual myopia); Twin B – single vision spectacles).

		Baseline		24-month			25-month (after ceasing orthokeratology treatment)		
		SER (D)	Best corrected VA	SER (D)	Percentage increase in SER (%)	Best corrected VA	SER (D)	Percentage increase in SER (%)	Best corrected VA
Twin A	OD	−3.08	−0.02	−0.62*	–	−0.04	−3.42	11	−0.06
	OS	−2.44	−0.08	−1.08*	–	0.00	−3.60	48	−0.14
Twin B	OD	−1.97	−0.10	−3.69	87	0.00	–	–	–
	OS	−2.81	0.04	−4.70	67	−0.02	–	–	–

(NKL Contactlenzen, Netherlands) and made from Menicon Z material (Menicon Co. Ltd, Nagoya, Japan). The initial lens parameters were determined with the Easyfit software (NKL Contactlenzen, Netherlands) based on imported corneal topographic data, horizontal visible iris diameter and the manifest subjective refraction of the subject. Contact lens care products (Table 1) were provided for the subjects during the study period. Deliveries of the ortho-k lenses and spectacles to the twins were arranged on the same day. Twin A was required to wear the ortho-k lenses every night for at least six hours and he was also instructed to return for aftercare after the first overnight, one week and one month of lens wear, to ensure good correction of refractive errors and ocular health.

The target of the ortho-k lenses was increased if unaided visual acuity (VA) was worse than logMAR 0.20 or if residual myopia was more than 0.50 D after stabilization of the treatment. The spectacles prescription of Twin B was also updated if there was more than 0.50 D difference with the habitual spectacles at any of the data collection visits. Cycloplegic examination was arranged every 6 months for both subjects. VA measurement was performed before cycloplegia using the high contrast ETDRS chart (Precision Vision, La Salle, IL, USA). Anterior corneal power (average of the SimK) was also measured using Medmont E300 (Medmont Pty Ltd, Melbourne, Victoria, Australia) and the central corneal thickness (CCT) and the posterior corneal power were measured using the Pentacam (Oculus, Wetzlar, Germany). Auto-refraction using the Shin-Nippon SRW-5000 open-field auto-refractor (Shin-Nippon Commerce Inc., Tokyo, Japan) and axial length (AL) measurement using the IOL Master™ (Zeiss Humphrey System, CA, USA) were performed by a masked examiner after cycloplegia.

During the study period, the ortho-k lenses and the spectacles of the subjects were updated once (at 12 month) and twice (at 6 and 18 month) for Twin A and Twin B, respectively, during the study period due to increased refractive errors.

2.1. Changes in refractive errors

The pre-treatment cycloplegic auto-refraction spherical equivalent refraction (SER) of Twin A were −3.08 D (OD) and −2.44 D (OS) and of Twin B were −1.97 D (OD) and −2.81 D (OS). At the end of the study period, Twin A was asked to return for a re-stabilization (RS) visit every week, after stopping ortho-k lens wear, to review the stabilization of the refractive errors and the corneal topography. One month after cessation of lens wear (25-month), less than 0.25 D difference in SER and corneal topography from the previous RS visit (1 week before) and the refractive status of his eyes in that visit was considered stabilized. In terms of manifest refractive errors, the changes over the two years in Twin A were −0.34 D (OD) and −1.16 D (OS) and −1.72 D (OD) and −1.89 D (OS) in Twin B. Table 2 shows the percentage increase in SER and the best corrected VA of the two subjects over the 2-year study period.

2.2. Changes in corneal parameters

CCT decreased in Twin A during ortho-k wear but returned to original after cessation of ortho-k, whereas CCT slightly increase in Twin B after 24-month. The posterior corneal powers did not change significantly in both subjects during the study period. The anterior corneal power of Twin B at the baseline and 24-month visit remained the same while a decrease of 0.40 D (OD) and 0.60 D (OS) in anterior corneal power was observed in Twin A one month after cessation of ortho-k lens wear (Table 3).

2.3. Changes in AL

Increases in AL were observed in both eyes of each subject during the study period as shown in Fig. 1. The increase in AL was significantly larger in Twin B than in Twin A. The overall increases in AL were 0.52 mm (OD) and 0.70 mm (OS) in Twin A; 0.77 mm (OD) and 0.82 mm (OS) in Twin B. Fig. 1 shows the AL progression of the twins during the two years. For Twin A, AL measured at the end of the study period was not different from those measured one month after cessation of ortho-k lens wear.

3. Discussion

This is the first case report to present a comparison of the myopic control effect of ortho-k on twins. With two genetically identical twins who shared the same amount of daily activities attempting two different myopic control treatments, the confounding factors which may affect the responses can be minimized. Although the