Original Article

Analysis of the Prevalence and Situation of Myopia in Adolescents from South China

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Abstract

Purpose: To conduct dynamic detection of refraction changes in adolescents with myopia and analyze the correlation between different reexamination times and factors that included age of onset, initial refractive power, and rate of myopia progression.

Methods: A total of 900 adolescents (aged 6–15 years) with myopia admitted to Zhongshan Ophthalmic Center between 2009 and 2013 were randomly selected in this investigation. All participants underwent objective refraction measurement with an autorefractometer (Topcon 8900) or streak retinoscopy and subjective refraction detection with an autorefractor (Nidek) or minus-lens procedures at different time intervals (6 months, 1, and 2 years). Accurate refractive power was obtained. All data were analyzed with SPSS 18.0 statistical software.

Results: The mean refractive power was increased by 0.56± 0.37 diopters(D) after 6 months, by 0.83±0.45 D after 1 year, and by 1.50±0.70 D after 2 years. Among the 900 adolescents, the most rapid increase in refractive power was observed at the age of 8 years at the 6-month reexamination, at the age of 8 and 9 years at the 1-year reexamination, and at the age of 7-9 years at the 2-year reexamination. The increase in index of refraction tended to diminish with aging. The different cycles of reexamination revealed a slowing of the rate of myopia progression along with the increase in the initial index of refraction. The highest rate of myopia progression was noted in low-myopic adolescents with initial refractive power ranging from -0.25 to 2.75 D.

Conclusion: No positive correlation was documented between different cycles of reexamination and the refractive power. The increase in refractive power was associated with factors that included the reexamination cycle, age of onset, and initial refractive power. (***Eye Science 2015; 30:53–55***)

Keywords: adolescent; myopia; refractive power; age; reexamination

DOI: 10.3969/j.issn.1000–4432.2015.02.001

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Introduction

The prevalence of myopia, one of the most common eye diseases, is worsening worldwide, especially in adolescents. For instance, adolescents aged 15 years in Guangzhou, China have an incidence of myopia as high as 78.4%[1–4]. The progression of myopia is a complex process induced by a variety of factors. In this study, the situation and development of myopia in 900 adolescents from South China, aged 6–15 years, was retrospectively analyzed, with the aim of investigating the increase in refractive power at different time points of reexamination and exploring the relationship between the increase in refractive power and factors such as age of onset and initial refractive power.

Materials and methods

General data

A total of 900 myopic adolescents aged 6-15 years admitted to Zhongshan Ophthalmic Center between 2009 and 2013 were randomly selected for this study. Among these subjects, 300 individuals were re-examined at 6 months (5-7 months), 300 at one year (11-13 months), and 300 at two years (24-30 months). No participants showed any organic pathological changes.

Examination methods

Clinical data of 900 individuals were retrospectively analyzed. The changes in refractive power were recorded and analyzed.

Refraction measurement: Prior to refraction measurement, alternative eye diseases were excluded by a conventional ocular examination. Tropicamide was instilled three times into the eyes for pupillary dilation, once every 10 min. The subjects then underwent refraction measurements with an autorefractor

(Topcon KR8900), retinoscopy (streak retinoscopy), and manifest refraction measurements (refractometer or minus-lens procedures). Accurate refractive power was obtained and recorded in the archive system of the Zhongshan Ophthalmic Center.

Statistical analysis

SPSS 18.0 statistical software (SPSS Inc. Chicago, IL) was utilized for data analysis. A value of $P < 0.05$ was considered statistically significant.

Results

The initial refractive power of all participants of different ages is illustrated in Table 1.

Table 1 Basic data for 900 myopic South China adolescents aged 6–15 years

Age(year)	Reexamination time			
	Initial refractive power (D)	Half a year (n)	One year (n)	Two years (n)
6	3.21±2.61	15	13	11
7	2.30±1.94	26	20	17
8	2.05±2.23	43	21	21
9	1.96±1.15	41	24	33
10	2.37±1.57	33	39	51
11	2.34±1.78	43	58	47
12	2.25±1.66	39	43	46
13	2.46±1.76	24	40	33
14	3.03±1.83	23	27	26
15	3.17±2.66	13	15	15
Total		300	300	300

During the 6-month reexamination, the refractive power was increased by 0.59±0.38 D for the right eye and 0.53±0.37 D for the left, At 1 year, the increase was 0.84±0.44D for the right and 0.82±0.45D left eyes. At 2 years, the increase was 1.54±0.68 D for the right eyes and 1.46±0.71 D for the left eyes.

The age distribution did not significantly differ among at 6 months, 1 year, and 2 years ($P = 1.00$). Initial refractive power was not significantly different at 6 months, 1 year, and 2 years ($P = 0.999$).

Relationship between increasing refractive power and age

The 6-month reexamination revealed the highest increase in refractive power (0.721D) in adolescents aged 8 years, (mean 0.561±0.371 D). At the 1-year reexamination, the highest increase in refractive power was 1.202 D in subjects aged 8 and 9 years (mean 0.83±0.448 D). At the 2-year reexamination, the largest increase in refractive power was 2.217 D in individuals aged 7-9 years(mean 1.499±0.696 D). The increase in refractive power tended to slow down with aging in all participants(Figure 1).

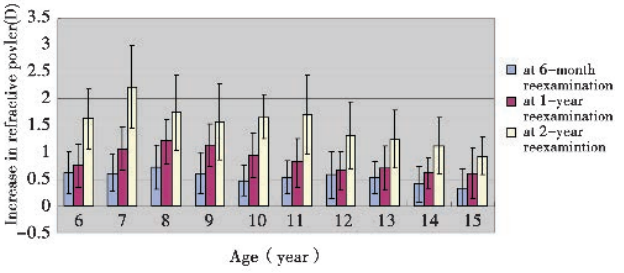

Figure 1 Changes in refractive power over aging

Relationship between the initial refractive power and the increase in refractive power

Based on their initial refractive power measurements, all adolescents were categorized as having low (-0.25~2.75 D), moderate (-3.00~5.75D), or high myopia (≥-6.00D). The highest increase in refractive power was observed in individuals with low myopia, followed by their moderate and high myopic counterparts(Figure 2).

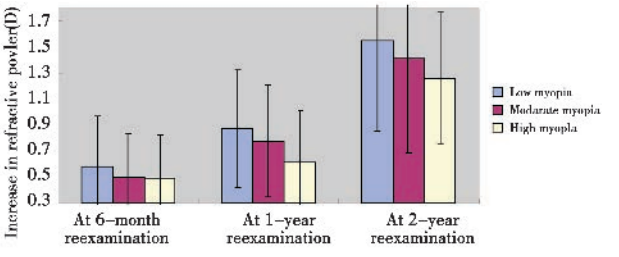

Figure 2

Comparison of refractive power increases between bilateral eyes

At the 6-month reexamination, the mean increase in refractive power of the right eyes was 0.59±0.38 D, which was higher than the 0.53±0.37 D measured for the left eyes. At the 1-year reexamination, the refractive power of the right eyes was increased by an average of 0.84±0.44 D, which again was larger than the 0.82±0.45 D measurement obtained for the left eyes. At the 2-year reexamination, the refractive power of the right eye was increased by an average of 1.54±0.68 D, which was larger than the measurement of 1.46±0.71 D obtained for the left eyes.

Discussion

Among myopic South China adolescents aged 6-15 years, the refractive power of bilateral eyes was increased by a mean of 0.56±0.37 D at 6 months and 0.83±0.45 D at 1 year, which represented a 1.42-fold increase for a doubling of the time interval for reexamination. If the 1-year interval was divided into two 6-month intervals, the increase in refractive power at the 1-year reexamination would be smaller than that at two 6-month reexaminations, by 0.3 D. In this study, adolescents receiving 1-year reexamination wore undercorrecting glasses in the second half of the year. However, Wang et al. found that individuals wearing full-correction glasses had slower progression of myopia compared with those wearing undercorrecting glasses[5]. Yang et al. demonstrated that full-correction glasses could delay the progression of myopia[6]. The results in this study indicated that undercorrection of myopia may not promote an increase in refractive power. Similarly, Chen et al. found that full correction and wearing glasses for a long time affected the progression of myopia. Hence, adolescents should wear undercorrecting glasses or even avoid wearing glasses entirely[7]; this may reflect a difference in terms of age distribution or the time interval of continuous observation.

The highest increase in refractive power at 6-month and 1-year reexaminations was observed in adolescents aged 8 years, and in adolescents aged 7-9 years for the 2-year reexamination, suggesting that the most significant increase in refractive power occurs in myopic adolescents at the age of 8. In China, most children begin primary school at age 6 and start to have more courses and spend less time in outdoor activities compared with their counterparts in kindergarten. This may account for the occurrence of myopia at age 8[8] and may indicate that the aggravation of myopia is intimately correlated with the visual environment[9]. Parents and teachers should instruct adolescents to use their eyes in a healthy manner and to spend a certain amount of time in outdoor activities[10,11]. In addition, the increase in refractive power tends to slow down with aging[12], probably because physical development stabilizes as adolescents get older.

In this study, we found that the adolescents with low myopia had the most rapid increase in refractive power, followed by those with moderate and high myopia. Excluding conditions of pathological myopia, the majority of patients with low myopia are aged < 10 years and present with the highest increase in refractive power. In this study, the increase in refractive power higher in the right eye than in the left, possibly reflecting a more frequent use of the right eye[13–15].

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