Comparison of the Effects of Progressive Multifocal Lens and Single-Light Glasses and Rigid Permeability Corneal Contact Lens on the Progression of Juvenile Myopia

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Keywords: Progressive Multifocal Lens, Monophores, Rigid Breathable Corneal Contact Lens, Juvenile, Myopia

Abstract: Objective: To compare the effects of progressive multifocal lens and single-light glasses and rigid breathable corneal contact lens on the progression of juvenile myopia. Methods :90 cases of myopic adolescents in our hospital (February 2018 to March 2019) were randomly divided into three groups, which were given progressive multifocal lens, single-light glasses, rigid breathable corneal contact lens to correct squarely, and to measure and compare the ocular biological parameters of the patients. RESULTS: Before correction, the parameters of ocular biology were P>0.05 in the three groups. After one year of follow-up, all the three groups showed an increasing trend of equivalent diopter and gradually increased diopter in the polyfocal group (-0.52±0.34) D, increase in diopter of monophores (-2.66±0.75) increased diopter in the D, rigid breathable corneal contact lens group (-0.45±0.52) D, three groups, P<0.05.Conclusion: compared with single-light glasses, progressive multifocal lens can delay the growth of myopia in patients with implicit oblique, and rigid permeability corneal contact lens can effectively delay the progress of myopia, but both methods can not prevent the progress of myopia.

1. Introduction

In recent years, with the popularity of modern electronic products such as mobile phones and computers, the rate of myopia in China is on the rise, becoming a country with high incidence of myopia, and the age of onset is also obviously early, indicating that more and more children have myopia[1]. The low vision rate of primary and middle school students and college students in China is increasing, which has a great impact on the physical and mental health of teenagers in China. It can be seen that active prevention of juvenile myopia and control of myopia has become a problem that people must pay attention to[2]. Wearing appropriate glasses is the main method to control and delay myopia. In the treatment of glasses correction, wearing different glasses will also produce different effects, need to carry out in-depth research, to provide adolescents with better control of myopia correction of glasses. in this study ,90 cases of myopia adolescents in our hospital (february 2018 to march 2019) were selected to compare the mitigation effects of progressive multifocal lens and single-light glasses, rigid breathable corneal contact lens on myopia progression.

2. Information and Methodology

2.1. General Information

Thirty-nine adolescents (February 2018 to March 2019) were randomly divided into three groups :18 men and 12 women, aged 9-15(11.87±1.42) years, learning eye (8.73±1.73) h, television computer time (8.62±1.84) h, sleep time (8.74 0.75),18 parents with myopia ,17 men and 13 women with single-light glasses (11.14).±45±1.35) years old, study with eyes (8.70±1.68) h, television computer time (8.51), sleep time (8.59±0.83), parents myopia 19 cases, rigid permeability corneal

  DOI: 10.25236/medsbe.2020.021

contact lens correction of the face of men and women 16 cases ,14 cases, age 8-14(10.75±1.42) years old, study with eyes (8.81±1.52) h, television computer time (8.81). sleep time (8.82±0.57) h,17 cases of myopia in parents. general data contrast, P>0.05.

Inclusion criteria: all signed consent forms; ages 6-16.

Exclusion criteria: the presence of other eye diseases, hereditary myopia and other diseases.

2.2. Methodology

Patients were subjected to progressive multifocal lens, single-light glasses, and rigid breathable corneal contact lens to correct the face. Patients under 12 years of age were given atropine eye drops for 1 week, patients over 12 years of age were given compound topiramide eye drops for 5 min,4 times and then stopped for 20 min, after mydriasis. Eye axis was measured by ophthalmic A/B ultrasonic diagnostic instrument.The corneal yield was measured by computer optometry and corneal instrument. followed up for 1 year.

2.3. Observation Indicators

Diopter, corneal flexion, ocular axis length, lens thickness, anterior chamber depth.

2.4. Statistical Methods

SPSS20.0, Metrics indicate () $\bar{x} \pm s$ n,%, test, P<0.05, the difference was statistically significant. x^2

3. Results

3.1. Correction of Biological Parameters in the Anterior Eye

Before correction, three groups of patients with ocular biological parameters were compared, P>0.05, see Table 1.

Table 1 Biological parameters of anterior eye corrected

Group	Diopter (D)	Corneal yield (D)	Eye axis length (mm)	Crystalline thickness (mm)	Front Room Depth (mm)
Hard breathable corneal contact lens (n=30)	-2.84±0.98	42.74±1.63	24.48±0.94	3.52±0.73	3.64±0.29
progressive multifocal mirror (n=30)	-2.53±0.67	43.29±1.71	24.83±0.82	3.44±0.65	3.49±0.43
Glasses (n=30)	-2.66±0.75	43.58±1.59	24.72±0.75	3.72±0.87	3.54±0.71
F	0.5823	0.6264	0.3524	0.7463	0.6254
P	0.7662	0.4863	0.7256	0.3862	0.5521

3.2. Eye Parameters and Changes During One Year Follow-Up

The biological parameters of the eyes were shown in Table 1 for one year follow-up, and the diopter of the progressive multifocal group increased (-0.52±0.34) D, increase in diopter of monophores (-2.66±0.75) increased diopter in the D, rigid breathable corneal contact lens group (-0.45±0.52) D, three groups, P<0.05, see table 3.

Table 2 Eye parameters for one year of follow-up

Group	Diopter (D)	Corneal yield (D)	Eye axis length (mm)	Crystalline thickness (mm)	Front Room Depth (mm)
Hard breathable corneal contact lens (n=30)	-3.28±0.91	42.30±1.53	24.93±0.74	3.50±0.28	3.74±0.30
progressive multifocal mirror (n=30)	-2.77±0.84	43.46±1.50	24.72±0.91	3.44±0.17	3.53±0.21
Glasses (n=30)	-3.37±0.77	42.73±1.61	24.72±0.73	3.55±0.18	3.781±0.35

Table 3 Comparison of changes of eye biological parameters in patients

Group	Diopter (D)	Corneal yield (D)	Eye axis length (mm)	Crystalline thickness (mm)	Front Room Depth (mm)
Hard breathable corneal contact lens (n=30)	-0.45±0.52	-0.24±0.37	0.17±0.18	-0.03±0.19	0.12±0.29
progressive multifocal mirror (n=30)	-0.52±0.34	-0.21±0.20	0.27±0.26	-0.03±0.22	0.04±0.13
Glasses (n=30)	-0.94±0.45	-0.20±0.24	0.26±0.37	-0.01±0.21	0.13±0.31
F	29.6345	0.6193	6.0329	0.8026	8.6321
P	0.0137	0.6026	0.0754	0.2974	0.0756

4. Discussion

Teenagers have heavy learning tasks, long eye use time, and most of them have bad eye habits, weak consciousness, can not better protect glasses, and the popularity of electronic products is also an important cause of myopia among teenagers, which makes adolescents become the main people with myopia.[3]At present, people have raised their awareness of self-care and gradually paid attention to the prevention of myopia. Some people have developed good habits, but these measures are not enough, and active intervention measures are needed to delay the increase in the degree of myopia and correct myopia. There are two treatment methods in myopia correction, one is non-surgical treatment, the other is traumatic treatment, the former is mainly for myopia patients wearing orthodontic treatment glasses, the latter is mainly molecular laser keratectomy, corneal lens surgery and so on, these treatment methods are more suitable for the nearsighted people over 18 years of age with relatively stable refractive, but also can bring a lot of convenience for people, but not for the development of young people.[4]. Therefore, in the treatment of juvenile myopia correction, the main use of wearing corrective treatment glasses to correct vision.

Myopia has a great influence on the health of adolescents in China. Genetic factors, visual environment and behavioral factors are the main causes of myopia, and behavioral and environmental factors also have a great influence on pathological myopia. Comparison of ocular biological parameters between the three groups before correction $P>0.05$. After one year of follow-up, the diopter of progressive multifocal mirror group increased (-0.52±0.34) D, increase in diopter of monophores (-2.66±0.75) increased diopter in the D, rigid breathable corneal contact lens group (-0.45±0.52) D, three groups, $P<0.05$. The rigid breathable corneal contact lens greatly reduces the retinal image magnification caused by frame glasses, broadens the field of vision, and can effectively eliminate irregular astigmatism and so on. Research shows[5]rigid breathable corneal contact lens can provide the best visual function, that is to obtain the best quality retinal optical imaging, such as visual sensitivity, contrast sensitivity and so on. In this study, although the degree of myopia deepening in the rigid permeability corneal contact lens group is light, the eye axis and photometric number still increase, indicating that this method can not completely prevent myopia, only slow the progression of myopia. Some studies have shown that rigid breathable corneal contact lens may make the anterior chamber shallower, but this study shows that the depth of the anterior chamber in each group has increased, and the reason for this situation may be that the subjects selected in this study are adolescents, and the eyeballs of patients at this stage are in the developmental stage. It should be noted that in the early stage of wearing rigid breathable corneal contact lens, patients will have a strong foreign body sensation, patients with poor compliance when wearing, even appear resistance, and parents are also relatively cautious, once the patient has abnormal feelings, parents will be very nervous, and then wear failure. Therefore, when wearing, parents and patients need to explain the relevant information, indicating the normal response to discomfort, do not worry, and detailed introduction of its advantages and disadvantages, give encouragement, and then improve the degree of wearing fit. At present, there is still no conclusion about how much more suitable the clinic is for near addition. Some scholars believe[6]+0.75 D near addition can guarantee the imaging quality. This study matched the progressive mirror with +2.00 D

of light in patients with implicit oblique and regulatory lag, and the myopia increased less than that with single light. The collection demand of patients with implicit oblique is less, so as to ensure single eye and double vision, in this case, there will be a situation of adjustment lag, and then hyperopia defocus, eye axis extension, myopia growth. The progressive multi-focus lens can compensate the adjustment lag, improve the adjustment accuracy and prevent the hyperopia defocusing. This method is not effective in the control of juvenile myopia because ejection of light leads to a physiological state of being out of focus, which requires adjustment in order to see things clearly.[7].

To sum up, for juvenile myopia patients, the scientific wearing of progressive multifocal lens and rigid permeability corneal contact lens can effectively delay the progress of myopia, it should be noted that both methods can not prevent the progress of myopia.

Acknowledgements

This research has been financed by The Science Research Project in 2020 of Yunnan Provincial Fund “Research of myopia for school-age children in Qujing area” (2020J0805)

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