Original Article

Efficacy of Progressive Addition Lenses in the Treatment of Ametropia after the Single Eye's IOL Implantation

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Abstract

Purpose: To investigate the efficacy of progressive addition lenses on the treatment of ametropia and loss of accomodation after the single eye's IOL implantation.

Methods: Eighty four patients undergoing IOL implantation in single eyes were prescribed with progressive addition lenses for ametropia correction and regularly followed up to observe subsequent correction effect.

Results: Among these 84 patients, 72 could comfortably adapt to the use of progressive addition lenses to improve visual acuity and accomondation, while the remaining 12 patients failed to accomodate the usage of progressive addition lenses.

Conclusion: Wearing progressive addition lenses acts as a relatively feasible approach to improve visual acuity and alleviate disorders of accomodation for patients who underwent IOL implantation in single eyes. The patients should be prescribed with progressive lenses under professional instructions and guidance. (***Eye Science 2012; 27:143-146***)

Keywords: progressive addition lenses; single eye; IOL; ametropia; efficacy

IOL implantation has significantly higher efficacy upon patients' visual acuity and quality of life due to its radical improvement[1]. Due to the residual ametropia and accomodation loss of the operated eye, the patients can not see clearly at different distances, which severely affects their quality of life. Though multifocal lenses can somehow solve this problem, their application values are limited by pupil size, narrow visual field and decreased sensitivity of various degrees and poor surgical performance, etc[2,3]. Vision acuity difference and nonsynchronous accomodation ability between both eyes cause discomforts for patients with good binocular vision following IOL implantation. Seeking an effective method for vision correction is of great sig nificance for such patients. Recently, progressive multifocal lenses have gained significant improvement in terms of declined sensitivity in visual acuity correction. To discuss the lens efficacy and influential factors of applying progressive addition lenses in vision correction after IOL implantation, 84 patients receiving monocular/binocular IOL implantation, since April 2006, wore progressive addition lenses for ametropia correction and accomodation recovery and were followed up. Good efficacy was noted.

Materials and methods

Study subjects

A total of 84 patients undergoing IOL implantation in single eye with normal visual function and certain degree of stereopsis and without a history of strabismus were recruited in this clinical trial. The patients received refraction examination at 3 months postoperatively and wore appropriate progressive lenses. The correction effect was observed at 1 week, 1 month and 3 months later. Lens wearing instructions were given to patients according to individual feedbacks and symptoms.

General information

Preoperative visual acuity in the operated eyes: myopia: -0.00DS~5.00DS; hyperopia: +0.00~+4.50DS; astigmatism: -0.00~2.50DC;

Postoperative visual acuity in the operated eyes: 21 eyes with hyperopia ranging from 0.3 to 0.6; 63 eyes(0.7~1.2); bilateral corrected visual acuity ranging from 0.4 to 1.2.

Varilux comfort progressive addition lenses were purchased from Essilor Inc. (Essilor Inc., France). Progressive lens all wearers a maximum level of per-

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formance for a unique and comfortable vision, whatever the distance, in particular by a wider field of vision.

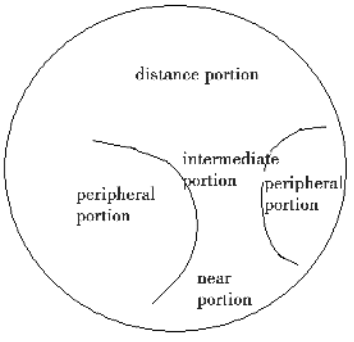

Figure 1

Progressive lens selection: According to the refraction of the operated eye and the requirement of the patients, prescribed the normal distance diopter for the progressive lens′ distance portion, and prescribed suitable additional diopter for near- working (such as for reading) portion, the additional diopters range from +2.50 DS to +3.50 DS. Progressive lens was chosen according to considering the relatively high ADD might lead to obvious lens distortion and wearing discomforts, the lens with spectacle frame height > 30 mm, distance vision area height > 12 mm, pupil height > 18 mm and progressive zone length > 12 mm, strictly complying with the national standard (GB13511-1999).

The presbyopic patients with declined accomodation wore lens resembling that of common presbyopic patients. Those with no presbyopia or disorders of accomodation wore single vision lens.

Clinical observation: The correction effect was observed at 1 week, 1 month and 3 months later, mainly including corrected distance vision and near vision. The discomforts and symptoms when wearing progressive lens were recorded and analyzed.

IOL position and fundus condition should be examined when the patients failed to adapt to wear progressive lens. Refraction test might be needed. Additionally, the patients should be advised to correctly wear progressive lens according to manufacturers′ instructions if necessary.

Results

Seventy two out of 84 patients (85.71%) properly adapted to wearing progressive lens. The remaining 12 patients failed to adapt to the use of progressive lens despite position adjustment and lens care guidance.

Corrected distance and near visual acuities

Eighty four patients (100%) wearing progressive lens obtained corrected distance vision equivalent to that of monocular lens in refraction examination. Seventy eight cases (92.86%) had corrected near vision equal to that in refraction examination.

The patients were instructed to wear the lenses under guidance, paid regular return visits. The feedbacks from patients were recorded and analyzed in Table 1.

As shown in Table 2, bilateral visual filed distortion and dizziness were found in 20 cases, accounting for 53.33% of all discomforts, as a main reason why patients failed to adapt to wearing progressive lens, followed by visual field insufficiency at near distance with a total of 10 patients (27.03%).

Relationship between lens correction effect and ametropia status

Distribution of refractive degrees in 72 patients who adapted to wearing progressive lenses was sum-

Table 1 Category of wearers′ main complaints when wearing progressive lenses

Category	Without any discomforts	With minor but tolerable discomforts	With intolerable discomforts
No. of cases	47	25	12
Percentage	55.95%	29.76%	14.29%

Table 2 Category of 37 patients′ main complaints of discomforts when wearing progressive lenses

Category	Visual field insufficiency at far distance	Visual field insufficiency at near distance	Visual field insufficiency at middle distance	Bilateral distortion and dizziness
Acceptable (No. of cases)	1	7	3	14
Percentage	2.70%	18.92%	8.11%	37.84%
Unacceptable (No. of cases)	1	3	2	6
Percentage	2.70%	8.11%	5.41%	16.22%

marized in Table 3.

As shown in Table 3, the wearers with low degree of ametropia and with-the-rule astigmatism had the highest correction effect, followed by those with low degree of ametropia and against-the-rule astigmatism.

As shown in Table 4, the wearers with moderate and high degree of ametropia and with-the-rule astigmatism had the lowest correction effect, followed by those with moderate and high degree of ametropia and with-the-rule astigmatism.

Relationship between wearing effect and the corrected visual acuity of the wearers

As shown in Table 6, the higher binocular visual acuity, the better the correction effect of progressive

Table 3 Distribution of refractive degrees in 72 patients adaptable to wearing progressive lens

Category	Low degree of ametropia accompanied by		High and moderate degree of ametropia accompanied by	
	with-the-rule astigmatism	against-the-rule astigmatism	with-the-rule astigmatism	against-the-rule astigmatism
No. of cases	41	15	11	5
Percentage	56.94%	20.83%	15.28%	6.94%

Table 4 Distribution of refractive degrees in 12 patients failing to adapt to wearing progressive lenses

Category	Low degree of ametropia accompanied by		High and moderate degree of ametropia accompanied by	
	with-the-rule astigmatism	against-the-rule astigmatism	with-the-rule astigmatism	against-the-rule astigmatism
No. of cases	1	2	3	6
Percentage	8.33%	16.67%	25.00%	50.00%

Table 5 Category of corrected visual acuity of 72 patients adaptable to wearing progressive lenses

Category	Monocular corrected visual acuity > 0.6	Binocular corrected visual acuity > 0.6	Binocular corrected visual acuity < 0.6
No. of cases	53	59	13
Percentage	73.61%	81.94%	18.06%

Table 6 Category of corrected visual acuity of 12 patients failing to adapt to wearing progressive lenses

Category	Monocular corrected visual acuity > 0.6	Binocular corrected visual acuity > 0.6	Binocular corrected visual acuity < 0.6
No. of cases	2	4	8
Percentage	16.67%	33.33%	66.67%

lens and vice versa.

Discussion

Patients usually present with unmatched bilateral visual acuities and accommodation between both eyes after undergoing IOL implantation, requiring higher standards compared with those receiving IOL implantation in both eyes. Progressive addition lenses have a range of varying refractive degrees due to its special design, satisfying individual needs at various distances and avoiding the limitations of monocular lenses which require multiple pairs of glasses. In addition, progressive addition lenses have proper outer-designs and make patients′ life, work and social activity more convenient and smooth. However, certain technical defects inevitably lead to image-focus ing problems, such as, excessively narrow visual field, especially at middle and near distances. Certain degree of distortion was found in bilateral sides of progressive lens. The degree of distortion is worsened as the increase in ADD at near distance. Therefore, the wearers require certain amount of time to adapt to wearing progressive lens.

Postoperatively, IOLs were incapable of accomodating, relatively high ADD at near distance, mostly +3.00DS and large distortion area, al these events let the wearers require more time to adapt to the usage of progressive lens compared with presbyopic patients. The wearers should be explicitly informed of the potential discomforts and symptoms during adaptation period and make full preparations. Forty seven wearers could adapt to wearing progressive lens without any discomforts. Twenty five patients felt minor discomforts initially, while successfully adapt-

ed to wearing progressive lens after doctors' explanations and instructions. The two types of patients accounted for 85.71% of all subjects. These results supported that progressive lens remains one the primary approaches applied to correct ametropia and restore accomodation loss following IOL implantation in single eyes.

Progressive lens has certain design defects. In general, the lens was designed with relatively broad distant-eyesight area due to its high frequency of use, roughly above 1/3 of the lens surface. The patients had no discomforts when seeing objects at far distance. The variations of lens degrees are mainly condensed in the progressive area to satisfy the progressive lens and maintain near-eyesight area. The progressive lens is typically designed with narrow visual field at middle distance and distortion of cylinder lens and prism effect. Besides, degree of distortion is proportional to ADD. The higher ADD is, the more significant the lens distortion is[4]. Thus, it is more difficult for the patients to adapt to wearing progressive lens (36%). Near-eyesight area is located at bottom, whose visual field is wider than that of middle-eyesight area and can obtain 20 cm of non-distortion area at a reading distance of approximately 35 cm, but still significantly narrower than that of single vision lens. Therefore, visual field insufficiency at near distance is the second reason causing patients to fail to adapt (20%).

Analysis of the refractive degree of wearers revealed that lower residual ametropia and better corrected visual acuity enable the wearers to more easily adapt to wearing progressive lens. By contrast, the patients with high degree of ametropia (including high degree of astigmatism), ametropia and low corrected visual acuity have difficulties in adapting to the use of progressive lens[5]. Considering the technical design of progressive lens, high degree of ametropia leads to apparent distortion of lateral cylinder lens and prism effect, which is a major factor of failing to adapt to wearing progressive lenses.

The wearers may present with dizziness because of inevitable lateral distortion and narrow visual fields at middle and near distances. The patients with cardio-cerebrovascular disease, hypertension or migraine differ in terms of visual acuity recovery after IOL implantation[6]. The illnesses can cause dizziness, etc., and wearing progressive lens exacerbates the symptoms instead. Such patients should be prescribed with progressive lens by an ophthalmologist after serious consideration.

To sum up, progressive lens remains one of the best methods for correcting ametropia and restoring loss of accomodation in patients undergoing IOL implantation in single eyes, which should be conducted under national standard and detailed instruction. Although progressive addition lenses have certain technical limitations, they can satisfy individual needs at various distances and greatly improve postoperative visual acuity and enhance the patients´ quality of life.

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