

Stereopsis after Implantation of Intraocular Lens in Patients under 40 Years Old with Unilateral Cataract

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Abstract

Purpose: To investigate the stereopsis after single focus intraocular lens (SIOL) implantation in patients aged < 40 years with unilateral cataract.

Methods: In total, 36 patients (36 eyes) were divided into emmetropia and myopia groups. Twenty seven subjects with good uncorrected distance visual acuity (UCDVA) after surgery were enrolled in the emmetropia group. The myopia group consisted of 9 subjects whose one eye had mild myopia post-operatively and the other was emmetropic or myopic. Visual acuity, distance and near stereoacuity were measured post-operatively.

Results: In the emmetropia group, uncorrected near visual acuity (UCNVA) did not differ significantly between eyes ($t=1.87, P>0.05$). The LogMAR UCNVA of the operated and fellow eyes were (0.71 ± 0.12) and $(-0.05\pm 0.07, t=28.4, P<0.001)$ respectively. Distance stereoacuity was 60"; the near stereoacuity with uncorrected visual acuity and BCNVA in the operated eyes were 200" and 30" respectively ($Z=-4.121, P<0.001$). In the myopia group, the BCDVA did not differ significantly between the operated and fellow eyes ($t=-0.636, P>0.05$). The UCNVA of the operated eyes (0.18 ± 0.12) was significantly better compared with that of the fellow eyes $(-0.04\pm 0.10, t=4.2252, P<0.001)$. The distance stereoacuity with uncorrected visual acuity and BCDVA in the operated eyes were 200" and 60" respectively ($Z=-2.371, P<0.05$). The near stereoacuity with uncorrected visual acuity was 50".

Conclusion: For patients with unilateral cataract aged <40 years, stereopsis is closely associated with refractive status after IOL implantation. Near stereoacuity in emmetropic eyes can be improved with refraction, and that in mildly myopic eyes can be enhanced by leaving myopia uncorrected. (*Eye Science* 2012; 27:82-84)

Keywords: cataract; intraocular lens; stereoacuity; 40 years old

Current studies mainly focus upon post-operative stereopsis of elderly patients with cataract; relatively few investigations regarding patients aged <40 years have been reported. After receiving SIOL implantation, the operated eye does not possess regulatory function and is unable to obtain normal distant and near-vision simultaneously. In addition, the refraction status of the fellow eye may affect stereopsis. The present clinical trial is designed to observe the stereopsis of patients with unilateral cataract under various refraction statuses after phacoemulsification combined with SIOL implantation.

Patients and methods

General information

Subjects with unilateral cataract (aged <40 years) who underwent phacoemulsification combined with SIOL implantation between 2005 and 2006 in Zhongshan Ophthalmic Center were enrolled in this study. Participants were divided into emmetropia (range from -0.25 to $+0.5D, n=27$) and myopia ($<-3.0D, n=9$) groups. The emmetropia (or mild myopia) in contralateral eyes were $-0.25\sim+0.5D$ or $<-3.0D$. In the emmetropia group, ten cases had traumatic cataract, 14 had complicated cataract, and three had developmental cataract; there were 15 males and 12 females, aged from seven to 38 years, with a mean age 28 ± 9 years. In the myopia group, one case had traumatic cataract, seven had complicated cataract and one had cataract for unknown reason, five males, four females, aged from ten to 39 years with a mean age of 26 ± 10 years.

Inclusion criteria: the subjects aged <40 years; preoperative BCDVA and BCNVA of the operated eyes and the fellow eyes were >-0.097 (LogMAR); and those were not accompanied by other eye diseases such as strabismus, etc.

Methods

1.The refraction status was recorded and grouped according to the principle of BCVA.

2.UCDVA,UCNVA,BCDVA,and BCNVA were measured and statistically analyzed (LogMAR).

3.The distance stereoacuity in the two groups was detected by synoptophore and expressed as arcsecond (").

4.In the emmetropia group,the near stereoacuity under UCNVA and BCNVA,and that under UCNVA in the myopia group was detected by Randot near synoptophore.

Statistical analysis

SPSS 11.0 statistical software was used for data analysis. Visual acuity was compared by independent sample *t*-test. Stereoacuity was statistically analyzed by independent sample rank-sum test. *P* < 0.05 was considered statistically significant.

Results

Post-operative refraction status

The data were expressed as mean ± SD. In the emmetropia group, the mean refraction of the operated eyes was (0.03±0.25) D, and (-0.06±0.23) D of the fellow ones (*t*=1.377,*P*=0.1745). In the myopia group, the mean refraction of the operated eyes was (-1.58±0.13) D, and (-0.60±0.97) D of the fellow ones (*t*=-3.004,*P*=0.017).

Visual acuity

In the emmetropia group, UCDVA of the operated and fellow eyes did not significantly differ (*P*>0.05), while UCNVA and BCNVA of the fellow eyes was significantly better compared with those of the operated eyes(*P*<0.001). In the myopia group, UCDVA and BCDVA between the operated and fellow eyes did not significantly differ (*P*>0.05); however, UCNVA of the fellow eyes was significantly better than that of operated ones (*P*<0.001).

Stereoacuity

Distance stereoacuity: in the emmetropia group, the median distance stereoacuity under uncorrected visual acuity was 60", and the interquartile range (IQR) was 0", with no statistical significance (*Z*=-1.732,*P*> 0.05). In the myopia group, the stereoacuity under uncorrected visual acuity and corrected distance visual acuity were 200" and 60", and the IQR was 630" and 0", with a significant difference(*Z*=-2.371, *P*<0.05).

Near stereoacuity;in the emmetropia group, the near stereoacuity under uncorrected visual acuity was 200", and the IQR was 430"; the near stereoacuity under near corrected visual acuity was 30", and the IQR was 10". A statistically significant difference was noted before and after correction (*Z*=-4.121,*P*< 0.001). In the myopia group, the near stereoacuity under uncorrected visual acuity was 50", and the IQR was 45".

Discussion

Stereoacuity is an important visual function that enables people to perceive three-dimensional relationships of objects and accurately assesses the size, location, direction, and distance of surrounding objects. Stereoacuity examination can be divided into distance- and near-stereoacuity examinations. Distance stereoacuity examination is performed using a synoptophore, while near stereoacuity examination can be detected by multiple methods, such as Randot, Titmus, and TNO, etc¹.

It is generally considered that anisometropia and visual loss can cause injuries to stereoacuity. Lovesick² analyzed the relationship between stereoacuity and anisometropia in young people aged between 20 and 32 years and noted that near stereoacuity declined as anisometropia increased. When anisometropia was 1.0 D, near stereoacuity was maintained at 40".

Table 1 Comparison of visual acuity between the two groups ($\bar{x}\pm s$,LogMAR)

Group	Emmetropia group			Myopia group		
	UCDVA	UCNVA	BCNVA	UCDVA	BCDVA	UCNVA
Operated eyes	-0.02±0.07	0.71±0.12	0.06±0.08	0.36±0.10	-0.04±0.08	0.18±0.12
Fellow eyes	-0.07±0.12	-0.05±0.07	-0.06±0.04	0.22±0.29	-0.02±0.05	-0.04±0.10
<i>t</i>	1.87	28.4261	6.9714	1.369	-0.636	4.2252
<i>P</i>	0.069	<i>P</i> < 0.001	<i>P</i> < 0.001	0.204	0.5338	0.0006

Stereoacuity was lost when anisometropia was 4.0. Goodwin³ found that stereoacuity was 78" when binocular visual acuity declined to 0.6 (LogMAR). Monocular visual acuity declined to 0.6 (LogMAR) when the stereoacuity was 358". Levy⁴ also noted that the decrease of monocular visual acuity significantly reduced stereopsis. The patients with monocular senile cataracts lost regulatory function post-operatively, and fellow eye's regulatory function dropped. Binocular uncorrected near visual acuity did not restore to normal levels, and the near stereopsis declined.

The patients aged <40 with monocular cataract displayed different results. The operated eyes lost regulatory function, and uncorrected near visual acuity decreased. However, the contralateral eyes still possessed normal regulatory function and uncorrected near visual acuity was normal, leading to anisometropia. The present study found that distance stereoacuity in patients with binocular emmetropia under uncorrected visual acuity was normal, whereas near stereoacuity was abnormal. Corrected spectacles were used to eliminate anisometropia of operated eyes. Post-operatively, near visual acuity was enhanced and near stereoacuity was elevated from 200" to 30". The results revealed that the emmetropia patients aged below 40 years were required to wear corrected spectacles post cataract surgery to enhance near visual acuity and near stereopsis.

The surgically treated eyes in some patients had mild myopia after cataract surgery. In this circum-

stance, uncorrected distance visual acuity declined, while uncorrected near visual acuity increased. The results in this study indicated that mild myopia in patients aged <40 years following monocular cataract surgery contributed to the improvement of near stereopsis. However, distance stereopsis deteriorated, and required corrected spectacles to enhance.

Therefore, clinicians should determine refraction status according to the patients' various needs for stereopsis at work. For patients who worked in front of a computer or textile machine, etc., post-operative mild myopia should be considered to increase near stereopsis. For those engaged in driving, etc., good distance visual acuity and distance stereopsis should be guaranteed post-operatively. Therefore, such individual treatment can enhance the patients' quality of life significantly.

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