Comparative analysis of visual function between Tecnis Symfony intraocular lens and monofocal aspheric intraocular lens implantation

Long Yuan, Wang Jinhua*

Jingzhou Central Hospital Affiliated to Yangtze University, Hubei 434000, China

Abstract: Objective To compare and analyze the visual function of cataract patients after Tecnis Symfony intraocular lens (IOL) and monofocal aspheric IOL implantation. Methods Fifty cataract patients admitted to our hospital from October 2023 to December 2024 were selected and divided into experimental group (Tecnis Symfony IOL implanted□25 cases) and control group (Tecnis ZCB00 IOL implanted,25 case) according to the type of lens implanted. Postoperative vision, adjustment range, simultaneous viewing and fusing functions, far and near stereovision, Visual function satisfaction questionnaire survey, de-lens rate, defocus curve, contrast sensitivity. Results There was no significant difference in uncorrected visual acuity between the two groups at a distance of 5 m (P>0.05), but the visual acuity of the experimental group at a distance of 63 cm and 30 cm was significantly better than that of the control group (P<0.05).The accommodation amplitudes of right eye, left eye and both eyesin the experimental group were significantly better than those in the control group (P<0.05). There was no significant difference between the two groups in the number of patients with simultaneous visual function and fusion function (P>0.05). There was no significant difference in distance stereoscopic vision between the two groups (P>0.05), and the near stereovision of the experimental group was better than that of the control group (P<0.05). There were no patients with distance vision difficulties in both groups, and there was no significant difference in the number of patients with uncomfortable symptoms such as night glare between the two groups (P>0.05). Compared with the experimental group, the number of patients with difficulty in medium and near vision was significantly higher in the control group (P<0.05).The lens removal rate in the experimental group was significantly higher than that in the control group (P> 0.05).There were no significant differences in defocus curves and contrast sensitivity values between the two groups (P>0.05). Conclusion Tecnis Symfony IOL can better improve most visual functions of cataract patients than Tecnis ZCB00 IOL, but some aspects of visual function improvement still need to be optimized.

Keywords: Tecnis Symfony Intraocular Lens; Monofocal Aspheric Intraocular Lens; Cataract; Visual Function

Cataract is a common ophthalmology disease in modern society. It has a certain probability of causing blindness. The incidence will increase with age. With the increasingly serious aging, cataracts have become the main cause of reversible visual damage in many countries [1,2]. Under current medical conditions, surgery is still the first effective way to cure cataracts. The main surgery is cataract extraction combined with intraocular lens (IOL) implantation [3,4].The intraocular lenses used for surgery are mainly monofocal intraocular lenses, which have strong contrast sensitivity, night vision function and ability to see far distances clearly. However, patients still need to rely on glasses to assist them with postoperative myopia [5,6]. With the development of IOL, Tecnis Symfony IOL have been designed and put into cataract surgery, expanding the depth of field and increasing resistance to optical interference based on previous intraocular lenses [7, 8]. This study used Tecnis Symfony IOL and Tecnis ZCB00 IOL, comparing them with monofocal IOLs, to investigate the impact of two lens implantation on postoperative visual function.

1. Data and methods

1.1 General information

Review the cataract patients admitted to our hospital from October 2023 to December 2024 as the research objects.Inclusion criteria: (1) Patients diagnosed with cataracts;(2) Lens nuclear hardness is grade II to IV;(3) Astigmatism <1.5D. Exclusion criteria: (1) Concurrent other ophthalmic diseases;(2) Patients who have undergone ophthalmic surgery;(3) Concurrent other serious diseases. After screening, a total of

50 patients were included and were divided into two groups according to the type of lens implantation: Patients implanted with Tecnis 0 IOL served as the control group, 25 patients, eleven males had 22 eyes, 14 females had 28 eyes. The age was 53 to 71 years old, the average age was 63.6±5.73 years old. The patients implanted with TecnisSymfonyIOL were as the experimental group. There were 25 patients, 16 males with 32 eyes, 9 females with 18 eyes. The age was 54 to 70 years old, and the mean age was 61.24±5.36 years old. There was no statistical significance (P>0.05).

1.2 Surgical methods

Both groups underwent cataract extraction combined with intraocular lens implantation. The control group was implanted with Tecnis ZCB00 IOL, and the experimental group was implanted with Tecnis Symfony IOL.

1.3 Observation indicators

The observation indicators included five items: (1) Visual acuity comparison: the uncorrected visual acuity of 5 m, 63 cm, and 30 cm in both groups of patients at 3 months after surgery were compared. (2) Adjustment amplitude: The adjustment amplitude of one eye and both eyes of the two groups of patients was measured using the Slataper visual standard method. (3) Simultaneous visual fusion function: The simultaneous visual fusion function of both groups was recorded 3 months after surgery. (4) Far and near stereovision: The near and far stereovision of patients in both groups was recorded three months after surgery. (5) Visual function satisfaction questionnaire survey:Using the Qov Visual Quality Related Scale. The visual function of the two groups was recorded three months after operation. (6) Defocus curve:Patients 'distance vision was recorded from +1.0D to-4.0D using lens addition, draw a defocus curve.(7) Contrast sensitivity : After three months of follow-up.The comparative sensitivity of the two groups of patients under different spatial frequencies (1.5, 3, 6, 12, and 18c/d) in photopic environment was measured.

1.4 Statistical methods

Data statistics and analysis use SPSS 25.0. The measurement data were expressed in the form of mean ± standard deviation ($\bar{x}±s$), and the intra-group and inter-group data were compared and analyzed using t-test. The counting data were expressed in the form of number of cases and percentage (n/%), and the inter-group data were compared and analyzed using χ^2 test. When P<0.05, the difference was statistically significant.

2. Results

2.1 Comparison of vision conditions

There was no significant difference in visual acuity between the two groups at a distance of 5 m (P>0.05).The visual acuity of the experimental group at a distance of 63cm and 30cm was significantly better than that of the control group (P<0.05). The results shown in Table 1.

Table1 Comparison of binocular unaided visual acuity at different distances at 3 months after surgery between the two groups of patients [($\bar{x}±s$) logMAR]

Group	5 m	63 cm	30 cm
Experimental Group (n=25)	0.02±0.04	0.14±0.10	0.29±0.06
Control Group (n=25)	0.02±0.05	0.24±0.04	0.37±0.09
t	0.204	4.84	3.277
P	0.839	<0.001	0.002

2.2 Adjustment range comparison

The amplitude of accommodation in the right eye, left eye and both eyes in the experimental was significantly better than that in the

control group (P<0.05). The results shown in Table 2.

Table2 Comparison of adjustment amplitude of single and bilateral eyes between patients in the two groups (`x±s).

Group	Right Eye	Left Eye	Both Eyes
Experimental Group (n=25)	3.25±0.49	3.43±0.52	3.88±0.62
Control Group (n=25)	2.03±0.13	1.93±0.18	2.32±0.25
t	12.107	13.770	11.592
P	<0.001	<0.001	<0.001

2.3 Comparison of simultaneous visual fusion functions

There was no significant difference in the number of patients with simultaneous remote visual function and fusion function in the experimental group compared with the control group (P>0.05) The results shown in Table 3.

Table3 Comparison of simultaneous visual function fusion function between two groups of patients (n/%)

Group	Simultaneous Viewing Function	Lmage Fusion Function
Experimental Group (n=25)	24(96)	22(88)
Control Group(n=25)	23(92)	23(92)
χ2	0.355	0.222
P	0.552	0.637

2.4 Near and far stereo contrast

There was no statistical difference in distance stereovision between the two groups (P>0.05), and the near stereovision in the experimental group was significantly better than that in the control group (P<0.05). The results shown in Table 4.

Table4 Comparison of far and near stereovision between patients in the two groups (`x±s)

Group	Far stereo	Near stereo
Experimental Group (n=25)	78.42±65.54″	89.13±30.51″
Control Group (n=25)	63.29±55.14″	135.85±43.41″
t	0.883	4.403
P	0.382	0.001

2.5 Visual Function Satisfaction Questionnaire

There were no patients with distance vision difficulties in both groups. There was no significant difference between the two groups in the number of patients experiencing uncomfortable symptoms such as night glare (P>0.05). The number of patients with difficulty vision at close range in the control group was significantly higher than that in the experimental group (P<0.05).The results shown in Table 5.

Table5 Questionnaire survey on patient satisfaction with visual function and comparison of lens removal rate between the two groups (n/%)

Group	Remote Visual Difficulty	Middle-Distance Visual Difficulty	Near Visual Difficulty	Night Glare	The Lens Rate
Experimental Group (n=25)	0	0	0	2(8)	24(96)
Control Group (n=25)	0	4(16)	9(36)	0	12(48)
χ2	-	4.348	10.976	2.083	14.286
P	-	0.037	0.001	0.149	<0.001

2.6 Comparison of defocusing curves

As shown in Figure 1, the experimental group had the best vision at 0D and-0.5D, the control group had the best vision at 0D. Taking LogMAR visual acuity of less than 0.3 as the acceptable range,The depth of focus of the experimental group was 3.5D (+1D to-2.5D), and the depth of focus in the control group was 3D (+1D to-2D). There was statistical significance between the two groups from-1.5D to-4D
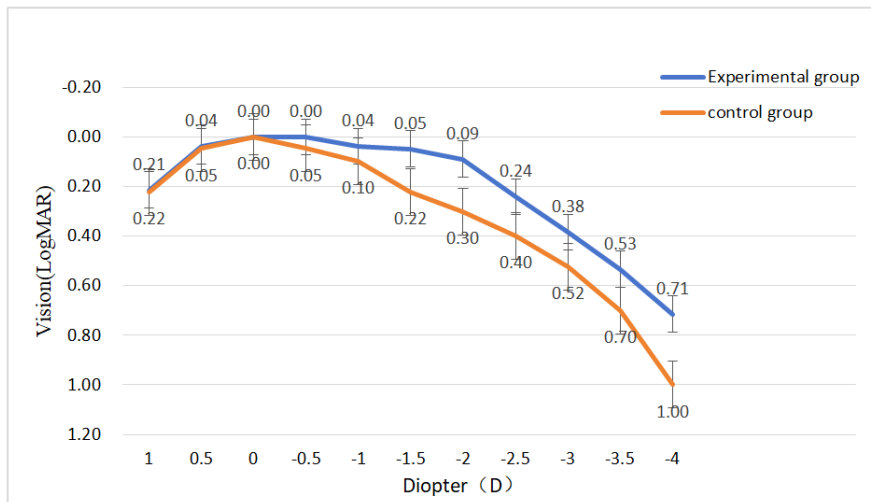
(P<0.05).

Figure1 Comparison of defocus curves between the two groups of patients

2.7 Comparison of sensitivity values

As shown in Figure 2, at different spatial frequencies (5, 3, 6, 12, 8 c/d). There was little difference between the two groups. The difference was statistically significant at 12 and 18c/d (P<0.05).
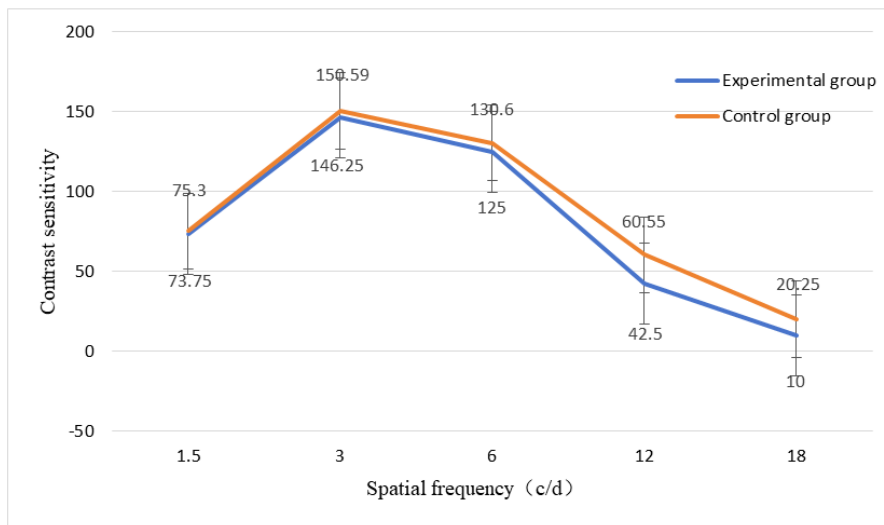

Figure2 Comparison of contrast sensitivity between the two groups

3. Discussion

Cataracts have become the leading cause of visual impairment in many aging countries, and cataract extraction combined with intraocular lens implantation is the current mainstream treatment method [9,10]. In recent years, medical technology has not only developed rapidly in major fields, but has also driven various emerging medical fields. Intraocular lenses have developed from monofocal IOLs to continuous vision intraocular lenses, and have been optimized in various aspects such as depth of field and optical interference resistance [11,12]. In this study, we compared the effects of Tecnis Symfony IOL and Tecnis ZCB00 IOL implantation on postoperative visual function in order to show the advantages and disadvantages of the two types of intraocular lenses in cataract treatment.

In the results of this study, the visual acuity comparison showed that there was no significant difference between the two groups at a distance of 5 meters, and the visual acuity of the experimental group was significantly better than that of the control group at a distance of 63

cm and 30 cm. Explain that through treatment, patients in the experimental group had better mid-and near uncorrected vision than patients in the control group, and Tecnis Symfony IOL had better mid-and near uncorrected vision improvement function than Tecnis ZCB00 IOL.

The comparison of the amplitude of accommodation between one and both eyes. The adjustment amplitudes of the right eye, left eye and both eyes in the experimental group were significantly better than those in the control group, indicating that Tecnis Symfony IOL performs better than Tecnis ZCB00 IOL in terms of accommodative amplitude. Comparison of long-distance simultaneous vision and fusion imaging functions found that there was no significant difference between the experimental group and the control group in the two aspects, It was shown that through treatment, the simultaneous visual and fusion functions of patients in both groups are improved, because both types of lenses can provide patients with high-quality distance vision. Comparison of near and far stereovision showed that the near stereovision of the two groups of patients was significantly better than that of the control group. It demonstrates that Tecnis Symfony IOL can improve patients 'near stereoscopic vision and provide patients with better visual quality.

A comparison of the visual function satisfaction questionnaire found that there was no significant difference in the number of patients with night glare between the two groups. Compared with the experimental group, the number of patients with near vision difficulty and middle vision difficulty was significantly higher in the control group. It was shown that Tecnis Symfony IOL can significantly improve patient's medium and close vision problems. The occurrence of glare in the experimental group suggests that Tecnis Symfony IOL still has a certain impact on the patient's night vision quality. However, due to time reasons, this study did not conduct long-term follow-up of patients for half a year or even a year. Whether these uncomfortable symptoms will improve in the later period remains to be seen.

Comparison of the defocus curves of the two groups of patients showed that the experimental group had the best vision at 0D and-0.5D. The depth of focus was 3.5D (+1D to-2.5D), and the control group had the best vision at 0D, with a depth of focus of 3D (+1D to-2D). There was little difference between the two groups in the range from +1D to-4D. It was shown that there is little difference in vision between the two lenses at different diopters. The comparison of sensitivity between the two groups of patients found that. There was little difference between the experimental group and the control group. However, both showed a trend of increasing first and then decreasing, indicating that the contrast sensitivity of the two lenses to patients was better improved in a short period of time after surgery. However, over time, its ability to influence gradually declines.

In summary, Tecnis Symfony IOL can better improve most visual functions of cataract patients than Tecnis ZCB00 IOL, but some aspects of visual function improvement still need to be optimized.

References

[1]Al-Omari R, Al-Shami K, Khamees A, et al. Evaluating the impact of undergraduate ophthalmology education on medical students' competency in eye care: a cross-sectional study in Jordan[J]. BMC Med Educ, 2025, 25(1): 266.

[2]Jeon W, Yoon C H, Oh J Y, et al. Risk factors in self-reported dissatisfied patients implanted with various presbyopia-correcting intraocular lenses after cataract surgery[J]. BMC Ophthalmol, 2025, 25(1): 82.

[3]Kuriyama T, Ono T, Eguchi S. Decentration and Tilt of Plate-Haptic Intraocular Lenses After Cataract Surgery: Anterior Segment Optical Coherence Tomography Evaluation[J]. Cureus, 2025, 17(1): e77634.

[4]Zhao T Y, Wang Y C, Sun Y J, et al. Conjunctival microbiota variations in a subset of middle-aged and elderly individuals from Beijing, China[J]. Int J Ophthalmol, 2025 , 18(2): 237-243.

[5]Du Q, Zhang Y, Huang Y. Peripheral Refraction and Axial Growth Rate After Multifocal or Monofocal Intraocular Lens Implantation in Chinese Pediatric Cataract Patients[J]. Invest Ophthalmol Vis Sci, 2025 , 66(2): 33. .

[6]Kim H, Ahn J, Seo M, et al. Efficacy and safety of the enhanced monofocal intraocular lens in glaucoma of varying severit[J]y. Sci Rep, 2025 Feb 8,: 4737.

[7]Chang D H, Kao A A, Huggins L K, et al. Clinical Evaluation of Violet Light Filtration and High-Resolution Lathing on a Diffractive Extended Depth of Focus IOL[J]. Ophthalmol Ther, 2024 , 13(12): 3135-3147.

[8]Kohnen T, Berdahl J P, Hong X, et al. The Novel Optical Design and Clinical Classification of a Wavefront-Shaping Presbyo-

pia-Correcting Intraocular Lens[J]. Clin Ophthalmol, 2023 , 17: 2449-2457.

[9]Paik B, Chua C H, Yip L W, et al. Outcomes and Complications of Minimally Invasive Glaucoma Surgeries (MIGS) in Primary Angle Closure and Primary Angle Closure Glaucoma: A Systematic Review and Meta-Analysis[J]. Clin Ophthalmol, 2025 , 19: 483-506.

[10]Porter M S, Flowers A, Wood B P, et al. Efficacy and Safety of Cataract Surgery Combined with Ab Interno Canaloplasty and Micro-Trabecular Bypass Stent Surgery in Open-Angle Glaucoma[J]. Clin Ophthalmol, 2025 , 19: 469-481.

[11]Esteban-Ibañez E, Gambra E, Marrakchi Y, et al. Perceptual cost and benefit of presbyopia-correcting intraocular lenses: effect of energy balance, addition, and adaptation[J]. Biomed Opt Express., 2025, 16(2): 849-871.

[12]Vila-Andrés R, Martínez-Espert A, Furlan W D, et al. Non-contact lensless holographic reconstruction of diffractive intraocular lenses profiles[J]. Sci Rep, 2025, 15(1): 566.

Author Introduction:

Long Yuan (1990-), female, Han ethnicity, from Ezhou, Hubei. Graduate student, attending physician, research focus on pediatric cataracts, strabismus, and amblyopia.

Corresponding author:Wang Jinhua (1974-), male, from Jiangling, Hubei. Master of Ophthalmology, Chief Physician, Master's Supervisor, with research interests in glaucoma, cataracts, and ocular surface diseases.