

Satisfaction and Visual and Refractive Outcomes Combining an Enhanced Monofocal and a Trifocal Intraocular Lens in Patients with Specific Visual Demands

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Background: To assess subjective satisfaction and visual and refractive outcomes after combining an enhanced monofocal intraocular lens (IOL) and trifocal IOL in patients with specific visual demands.

Methods: Patients underwent refractive lens exchange and received an enhanced monofocal lens (Tecnis Eyhance) in the dominant eye and a trifocal lens (FineVision) in the nondominant eye. At least 3 months after surgery, we evaluated subjective satisfaction, uncorrected distance visual acuity (UDVA), corrected distance visual acuity (CDVA), uncorrected intermediate visual acuity (UIVA), uncorrected near visual acuity (UNVA), predictability, safety, and efficacy.

Results: Sixty eyes from 30 patients met the inclusion criteria. At completion, postoperative binocular logMAR UNVA, UIVA, and UDVA were 0.10, 0.30, and 0.00, respectively. The change in visual acuity (before and after surgery, binocular) was statistically significant for UNVA and UDVA ($p < 0.01$ and 0.004 , respectively). Safety was better for the enhanced monofocal lens than for the trifocal lens ($p = 0.032$), with no statistically significant differences in efficacy between the eyes. No eyes lost lines of CDVA. Predictability for ± 0.5 D and ± 1 D was better in eyes with FineVision and Eyhance, respectively, although the differences were not statistically significant. Patient satisfaction was high, enabling most patients to meet their special visual needs.

Conclusion: Combining an enhanced monofocal IOL in the dominant eye with a trifocal IOL in the nondominant eye provides considerable satisfaction and spectacle independence and is safe and efficacious in patients with special visual requirements.

Keywords: mix and match, trifocal IOL, monofocal enhanced IOL, specific visual needs, subjective satisfaction

Introduction

Trifocal intraocular lens (IOL) implantation is currently one of the most frequently performed surgical technique for providing long-term spectacle independence in presbyopic patients with and without cataracts. However, the potential adverse effects, such as dysphotopsias (starbursts, halos, and glare) and reduced contrast sensitivity, especially at night and at distance, led to the development of newer IOL designs to reduce the likelihood of visual disturbances. Such effects are especially important for patients with highly demanding professional visual needs (eg, hauliers, night-time operators of large cranes) or leisure visual needs.

The subsequent advent of extended depth of focus (EDOF) and enhanced monofocal IOLs, classified by the ESCRS FVWG as extended partial “range of field” (RoF) and enhanced partial RoF IOLs, respectively, has reduced the

frequency of the specific negative visual symptoms associated with trifocal IOLs. Nevertheless, these lenses were associated with worse uncorrected near visual acuity (UNVA) and, therefore, greater spectacle dependence.¹

Based on our previously reported favourable results with implantation of a trifocal IOL only in the nondominant eye of emmetropic presbyopic patients,^{2,3} we began to treat ametropic-presbyopic patients with combined implantation of a trifocal IOL in the nondominant eye and an enhanced monofocal IOL in the dominant eye. This approach was expected to provide good visual outcomes and spectacle independence, as well as a high degree of subjective satisfaction in patients with increased or special visual needs.

To our knowledge, few studies have combined an enhanced monofocal IOL or an EDof IOL with a trifocal IOL, and none have combined an enhanced monofocal Tecnis Eyhance with a trifocal FineVision in patients with high visual demands.

Therefore, the aim of this study was to determine visual satisfaction and visual and refractive outcomes after implantation of an enhanced monofocal Tecnis Eyhance and a trifocal FineVision in the dominant and nondominant eye, respectively, in patients with high or special visual demands.

Materials and Methods

Design

This multicenter, multisurgeon, single-protocol, retrospective case series study included consecutively enrolled patients who had undergone refractive lens exchange with implantation of an enhanced monofocal IOL in the dominant eye and a trifocal IOL in the nondominant eye at our institutional network, encompassing multiple clinics in Europe (all preoperative data known).

Subjects

Data from 2020–10-07 to 2023–11-08 were retrieved from the central computerized clinical records system at Clinica Baviera, Spain. The study adhered to the principles of the Declaration of Helsinki and, given its retrospective nature, was approved by our institutional legal and ethics committee as an exempt review (Ethics Committee of Clinica Baviera, Spain).

All patients received detailed information before surgery, including the nature of the procedure and the expected outcomes, and gave their written informed consent to perform a “mix-and-match” procedure, as well as for the use of their anonymous and aggregated medical data for clinical research. Although no formal power calculation was performed due to the retrospective design, the sample size is consistent with previous exploratory studies on IOL combination strategies.

The study inclusion criteria were as follows: (i) presbyopia without cataracts, (ii) logMAR corrected distance visual acuity (CDVA) ≤ 0.2 in both eyes, (iii) high visual needs or wish not to experience dysphotopsias. The exclusion criteria were as follows: (i) cataract, (ii) ocular comorbidities, (iii) intra- or postoperative complications or preoperative ocular conditions other than ametropia or presbyopia potentially affecting visual acuity. The minimum follow-up period was 3 months.

Intraocular Lenses

The Tecnis Eyhance ICB00 (Johnson & Johnson Vision, California, USA) was chosen as the enhanced monofocal IOL to be implanted in the dominant eye. Eyhance is a biconvex single-piece, double C-loop haptics, refractive monofocal-EDof IOL made of an acrylic hydrophobic material with a total diameter of 13 mm and an optical zone of 6 mm with no angulation. Its spherical aberration (SA) profile is $-0.27 \mu\text{m}$ for a pupil size of 6 mm. The IOL design is based on a continuous refractive optical surface, which results in a progressive increase in power from the periphery towards the center of the IOL, thus improving intermediate and near vision compared to a standard monofocal IOL.

The trifocal FineVision Micro-F or FineVision Pod-F (both from PhysIOL, Liège, Belgium) was implanted in the nondominant eye. The FineVision Micro-F (single-piece, 4 loop haptics) and FineVision Pod-F (single-piece, double-C

loop haptics) combine 2 diffractive structures adjusted to offer a +3.50 D addition for near vision and a +1.75 D addition for intermediate vision; both have an aspheric profile with an SA of $-0.11\ \mu\text{m}$.

Surgical Procedures

Surgery involved standard uneventful phacoemulsification with implantation of the IOL in the capsular bag by experienced surgeons based on homogeneous perioperative protocols. IOL power calculation was based on IOLMaster 700 measurements (Carl Zeiss AG). The postoperative refractive target in all cases was emmetropia.

Clinical Evaluation

All surgical procedures were performed at our Spanish Group based on homogeneous preoperative assessment protocols. Patients underwent a complete ophthalmologic examination that included measurement of visual acuity under photopic conditions at approximately $85\ \text{cd}/\text{m}^2$, namely, uncorrected and corrected distance visual acuity (UDVA, CDVA) (Snellen auto chart projectors, Topcon Corp, Tokyo, Japan), UNVA, uncorrected intermediate visual acuity (UIVA) (Runge Near Vision Card, Good-Lite, Elgin, Illinois, USA), Pentacam corneal tomography (Oculus Optikgerate GmbH, Wetzlar, Germany), slit-lamp biomicroscopy, ocular surface/tear film evaluation, and fundoscopy. Visual and refractive parameters were assessed before and after surgery, except for intermediate vision, which was only assessed at the follow-up visits.

The preoperative examination for lens surgery also included endothelial cell count (SP 3000P; Topcon, Capelle, The Netherlands) and macular optical coherence tomography (SOCT Copernicus-REVO, Optopol-Tech, Zawirycie, Poland). Biometric parameters were assessed using the IOLMaster 700 (Carl-Zeiss-Meditec, AG, Jena, Germany).

Refractive and Visual Measures

The main measurements were monocular and binocular visual and refractive outcomes (especially binocular) and patient satisfaction, which were obtained from the last available visit, with at least 3 months of follow-up. Visual outcomes included logMAR UDVA, CDVA, UIVA, and UNVA. Refractive data included postoperative sphere, cylinder, manifest refraction spherical equivalent (MRSE), safety, efficacy, and predictability (percentage of eyes within $\pm 0.50\ \text{D}$ and $\pm 1.0\ \text{D}$). We also defined safety outcomes as the percentage of eyes with a loss of ≥ 1 and ≥ 2 lines of CDVA before and after surgery; efficacy outcomes were measured as the percentage of eyes with a difference between CDVA before surgery and UDVA after surgery ≥ 0 lines. The patient satisfaction questionnaire was used by our group in previous studies.^{3–5}

Statistical Analysis

VA values were converted from decimal and Jaeger units to the logarithm of the minimum angle of resolution (logMAR) for the statistical analysis. The Shapiro–Wilk test was used to check the normality of the variable, and the Levene test was used to assess the homogeneity of variances. The presence of outliers was determined using the box-plot method. The *t* test was used when a variable followed a normal distribution. When it did not, the Wilcoxon test and the Kruskal–Wallis test were used. Fisher's exact test was used to assess categorical variables. A *p* value < 0.05 was considered statistically significant. All statistical analyses were performed using R version 4.4. (2024; R Project for Statistical Computing).

Results

The study sample included 60 eyes from 30 patients (11 women, 36.7%). The mean age was 54.6 years (SD 5.1; range 43.8–67.8). No neodymium: YAG laser capsulotomies were performed during the follow-up period, and laser corneal enhancement was performed in 9 eyes to treat residual ametropia (4 in the enhanced monofocal group and 5 in the trifocal group).

Preoperative and postoperative monocular visual and refractive data and information on the axial length and power of the implanted IOL are shown in Table 1. Final postoperative refractive and visual outcomes did not differ between lenses/eyes for sphere, cylinder, MRSE, UDVA, UIVA, or CDVA ($p > 0.05$). As expected, the only significant postoperative differences between eyes were for UNVA ($p < 0.001$).

Table 1 Preoperative and Postoperative Monocular Visual and Refractive Data; Axial Length and Power of the Implanted IOL

	EYHANCE (N=30)	FINEVISION (N=30)	Total (N=60)	P-value
PREOPERATIVE				
Sphere (D)				p=0.548 ^a
Mean (SD)	2.38 (1.60)	2.46 (1.38)	2.42 (1.48)	
Median (Q1, Q3)	1.75 (1.25, 3.38)	2.12 (1.31, 3.00)	2.00 (1.25, 3.06)	
Cylinder (D)				p=0.617 ^a
Mean (SD)	-0.60 (0.44)	-0.56 (0.36)	-0.58 (0.40)	
Median (Q1, Q3)	-0.62 (-0.75, -0.31)	-0.50 (-0.75, -0.31)	-0.50 (-0.75, -0.25)	
MRSE (D)				p=0.554 ^a
Mean (SD)	2.08 (1.62)	2.18 (1.42)	2.13 (1.51)	
Median (Q1, Q3)	1.62 (0.94, 2.97)	1.75 (1.25, 2.75)	1.69 (1.09, 2.78)	
UNVA				p=0.764 ^b
Mean (SD)	0.69 (0.30)	0.65 (0.34)	0.67 (0.31)	
Median (Q1, Q3)	0.76 (0.51, 0.90)	0.76 (0.48, 0.90)	0.76 (0.48, 0.90)	
UDVA				p=0.731 ^a
Mean (SD)	0.43 (0.37)	0.43 (0.33)	0.43 (0.34)	
Median (Q1, Q3)	0.30 (0.22, 0.52)	0.40 (0.22, 0.52)	0.35 (0.22, 0.52)	
CDVA				p=0.110 ^a
Mean (SD)	0.03 (0.05)	0.01 (0.02)	0.02 (0.04)	
Median (Q1, Q3)	0.02 (-0.00, 0.05)	0.01 (-0.00, 0.02)	0.01 (-0.00, 0.03)	
AL				p=0.850 ^b
Mean (SD)	22.97 (0.90)	23.01 (0.89)	22.99 (0.89)	
Median (Q1, Q3)	23.08 (22.31, 23.51)	23.05 (22.31, 23.62)	23.05 (22.23, 23.59)	
Lens power				p=0.275 ^b
Mean (SD)	24.30 (2.52)	23.57 (2.63)	23.93 (2.58)	
Median (Q1, Q3)	23.75 (22.50, 26.00)	23.25 (21.62, 25.38)	23.50 (22.00, 25.62)	
POSTOPERATIVE				
Sphere (D)				p=0.864 ^a
Mean (SD)	-0.05 (0.49)	-0.01 (0.35)	-0.03 (0.42)	
Median (Q1, Q3)	0.00 (-0.38, 0.25)	0.00 (0.00, 0.25)	0.00 (-0.19, 0.25)	
Cylinder (D)				p=0.482 ^a
Mean (SD)	-0.29 (0.41)	-0.34 (0.39)	-0.31 (0.40)	
Median (Q1, Q3)	0.00 (-0.50, 0.00)	-0.25 (-0.50, 0.00)	-0.25 (-0.50, 0.00)	

(Continued)

Table 1 (Continued).

	EYHANCE (N=30)	FINEVISION (N=30)	Total (N=60)	P-value
MRSE (D)				p=0.936 ^b
Mean (SD)	-0.19 (0.47)	-0.18 (0.36)	-0.19 (0.42)	
Median (Q1, Q3)	0.00 (-0.50, 0.00)	0.00 (-0.38, 0.00)	0.00 (-0.38, 0.00)	
UNVA				p < 0.001 ^{*,a}
Mean (SD)	0.36 (0.23)	0.13 (0.16)	0.24 (0.22)	
Median (Q1, Q3)	0.30 (0.18, 0.48)	0.10 (0.00, 0.18)	0.18 (0.10, 0.30)	
UIVA				p=0.366 ^a
Mean (SD)	0.41 (0.26)	0.33 (0.24)	0.36 (0.25)	
Median (Q1, Q3)	0.39 (0.18, 0.60)	0.30 (0.10, 0.51)	0.30 (0.18, 0.60)	
UDVA				p=0.719 ^a
Mean (SD)	0.05 (0.07)	0.04 (0.08)	0.05 (0.08)	
Median (Q1, Q3)	0.02 (0.01, 0.08)	0.02 (0.01, 0.05)	0.02 (0.01, 0.05)	
CDVA				p=0.560 ^a
Mean (SD)	0.01 (0.04)	0.01 (0.02)	0.01 (0.03)	
Median (Q1, Q3)	0.01 (-0.00, 0.02)	0.01 (-0.00, 0.01)	0.01 (-0.00, 0.02)	

Notes: ^{*}Statistically significant, ^amann-Whitney test, ^bt test.

Abbreviations: IOL, intraocular lens; D, diopters; SD, standard deviation; Q1, first quartile; Q3, third quartile; MRSE, manifest refractive spherical equivalent; UNVA, uncorrected near visual acuity; UIVA, uncorrected intermediate visual acuity; UDVA, uncorrected distance visual acuity; CDVA, corrected distance visual acuity; AL, axial length.

Postoperative binocular logMAR UNVA, UIVA, and UDVA were 0.10, 0.30, and 0.00, respectively (Table 2A). Visual changes in monocular conditions (per lens) after surgery are shown in Table 2B, with statistically significant differences for UNVA and UDVA in both lenses (p=0.01). Table 2C shows the changes in visual acuity after surgery in both eyes. These were also statistically significant for UNVA and UDVA (p<0.01 and 0.004, respectively).

Table 2 Postoperative Visual Outcomes

A. Postoperative binocular visual acuity values for near, intermediate, and distance.	
UNVA	
Mean (SD)	0.1 (0.1)
Median (Q1, Q3)	0.1 (0.0, 0.2)
UIVA	
Mean (SD)	0.3 (0.2)
Median (Q1, Q3)	0.2 (0.1, 0.4)
UDVA	
Mean (SD)	0.0 (0.1)
Median (Q1, Q3)	0.0 (-0.0, 0.0)

(Continued)

Table 2 (Continued).

B. Postoperative change in monocular visual acuity by lens (eye).			
Visual Acuity (LogMar)	Preoperative	Postoperative	P-value*
EYHANCE			
UNVA	0.90 (0.54, 0.95)	0.30 (0.18, 0.30)	0.001**
UIVA		0.18 (0.18; 0.18)	
UDVA	0.30 (0.22, 0.52)	0.02 (0.01, 0.05)	0.000**
CDVA	0.02 (0.00, 0.05)	0.01 (0.00, 0.02)	0.266
FINEVISION			
UNVA	0.75 (0.48, 0.98)	0.05 (0.00, 0.16)	0.001**
UIVA		0.1 (0.1, 0.1)	
UDVA	0.40 (0.22, 0.52)	0.02 (0.01, 0.05)	0.000**
CDVA	0.00 (0.00, 0.02)	0.01 (0.00, 0.01)	0.872
C. Postoperative change in binocular visual acuity.			
Visual Acuity (LogMar)	Preoperative	Postoperative	P-value*
UNVA	0.76 (0.39, 0.76)	0.10 (0.00, 0.14)	<0.001**
UIVA		0.3 (0.10, 0.40)	
UDVA	0.18 (0.02, 0.33)	0.00 (0.00, 0.01)	0.004**
CDVA	0.00 (0.00, 0.01)	0.01 (0.00, 0.01)	0.494

Notes: *Wilcoxon signed-rank test, **Statistically significant.
Abbreviations: SD, standard deviation; Q1, first quartile; Q3, third quartile; UNVA, uncorrected near visual acuity; UIVA, uncorrected intermediate visual acuity; UDVA, uncorrected distance visual acuity; CDVA, corrected distance visual acuity.

In terms of visual indicators, safety was better for the enhanced monofocal lens than for the trifocal lens (p=0.032), with no statistically significant differences for efficacy between the eyes (Table 3). The efficacy and safety profile (percentage of eyes with no loss or gain of lines of vision) was slightly better in eyes with the Eyhance lens, albeit with

Table 3 Indicators of Safety, Efficacy, and Predictability

	EYHANCE (N=30)	FINEVISION (N=30)	Total (N=60)	P-value
Efficacy index				0.558 ^a
Median (Q1, Q3)	1.00 (0.94, 1.03)	0.99 (0.95, 1.00)	1.00 (0.94, 1.02)	
Mean (SD)	0.96 (0.16)	0.94 (0.15)	0.95 (0.16)	
Safety index				0.032 ^{*b}
Median (Q1, Q3)	1.02 (1.00, 1.06)	1.00 (0.98, 1.01)	1.00 (0.98, 1.03)	
Mean (SD)	1.04 (0.07)	1.00 (0.04)	1.02 (0.06)	
Efficacy no change or gain				0.718 ^c
No	4 (13.3%)	5 (16.7%)	9 (15.0%)	
Yes	26 (86.7%)	25 (83.3%)	51 (85.0%)	

(Continued)

Table 3 (Continued).

	EYHANCE (N=30)	FINEVISION (N=30)	Total (N=60)	P-value
Safety no change or gain				1.000 ^c
No	0 (0.0%)	0 (0.0%)	0 (0.0%)	
Yes	22 (100.0%)	24 (100.0%)	46 (100.0%)	
Predictability within $\pm 0.5D$				0.161 ^c
No	7 (25.9%)	3 (11.1%)	10 (18.5%)	
Yes	20 (74.1%)	24 (88.9%)	44 (81.5%)	
Predictability within $\pm 1.0D$				0.313 ^c
No	0 (0.0%)	1 (3.7%)	1 (1.9%)	
Yes	27 (100.0%)	26 (96.3%)	53 (98.1%)	

Notes: ^amann–Whitney test, ^bt test, ^cFisher's exact test. *Statistically significant.

Abbreviations: Q1, first quartile; Q3, third quartile; SD, standard deviation.

no statistically significant differences for either efficacy (86.7% vs 83.3% respectively, $p=0.718$) or safety (100% in both groups), (Table 3, Figure 1A and B). The results of the comparison between attempted and achieved spherical equivalent by groups (lenses) is shown in Figure 1C. Predictability for $\pm 0.5D$ and $\pm 1D$ was better in eyes with FineVision and Eyhance, respectively, although with no statistically significant differences (Table 3 and Figure 1D).

Results for postoperative subjective satisfaction are shown in Table 4. Twenty-three out of 30 patients (just over 76% of the total) responded to the questionnaire. Patients rated their distance, intermediate, and near visual acuity as good or very good in 82.6%, 91.3%, and 82.6% of cases, respectively (Table 4A). Night-time driving ability and night-time visual acuity were found to be equal to or better than preoperative values in 73.9% and 95.7% of patients, respectively (Table 4B). Finally, 95.7% of the patients did not need glasses for distance or intermediate activities, and 87% did not need glasses for near activities (Table 4C). Most patients (95.7%) were satisfied or very satisfied with the results, and 91.3% would undergo the same procedure (Table 4D).

Discussion

Our standard procedure for providing spectacle independence in presbyopic patients with and without cataracts is to implant a trifocal IOL in both eyes³ (continuous full RoF).¹ However, because of the undesirable adverse effects of these IOLs and because some patients do not wish to receive them for work or other reasons, implanting an enhanced monofocal IOL in the dominant eye and a trifocal IOL in the nondominant eye appears to be a good option for providing spectacle independence with a significant reduction in visual disturbances. The Tecnis Eyhance IOL has been shown to provide UDVA as good as that observed with classic monofocal lenses (narrow partial RoF IOLs),¹ albeit without photic phenomena.^{6–14} In addition, EDOF IOLs (extended partial RoF)¹ implanted in both eyes with or without mini monovision have been shown to successfully reduce photopic phenomena and other adverse effects.^{15–17} Based on these findings, some authors have combined EDOF or enhanced monofocal IOLs with trifocal IOLs, reporting good visual outcomes, a high level of subjective satisfaction, and a low risk of night-time visual disturbances.^{18–21}

In retrospective studies, different lens combinations have been compared, with good visual results at different distances and a high level of subjective satisfaction. For example, Kim et al¹⁹ compared the combination of the FineVision Triumf diffractive EDOF and the FineVision HP trifocal, and the combination of the Zeiss AT LARA diffractive EDOF and the AT LISA trifocal, obtaining good results for far, intermediate, and near distances. Hida et al²⁰ reported favorable clinical results when comparing the Tecnis Synergy ZFR00V trifocal lens in both eyes with a combination of the Synergy lens in the non-dominant eye and the Tecnis Eyhance ICB00 enhanced monofocal lens in the dominant eye. Other studies have also demonstrated the effectiveness of combining different types of lenses to

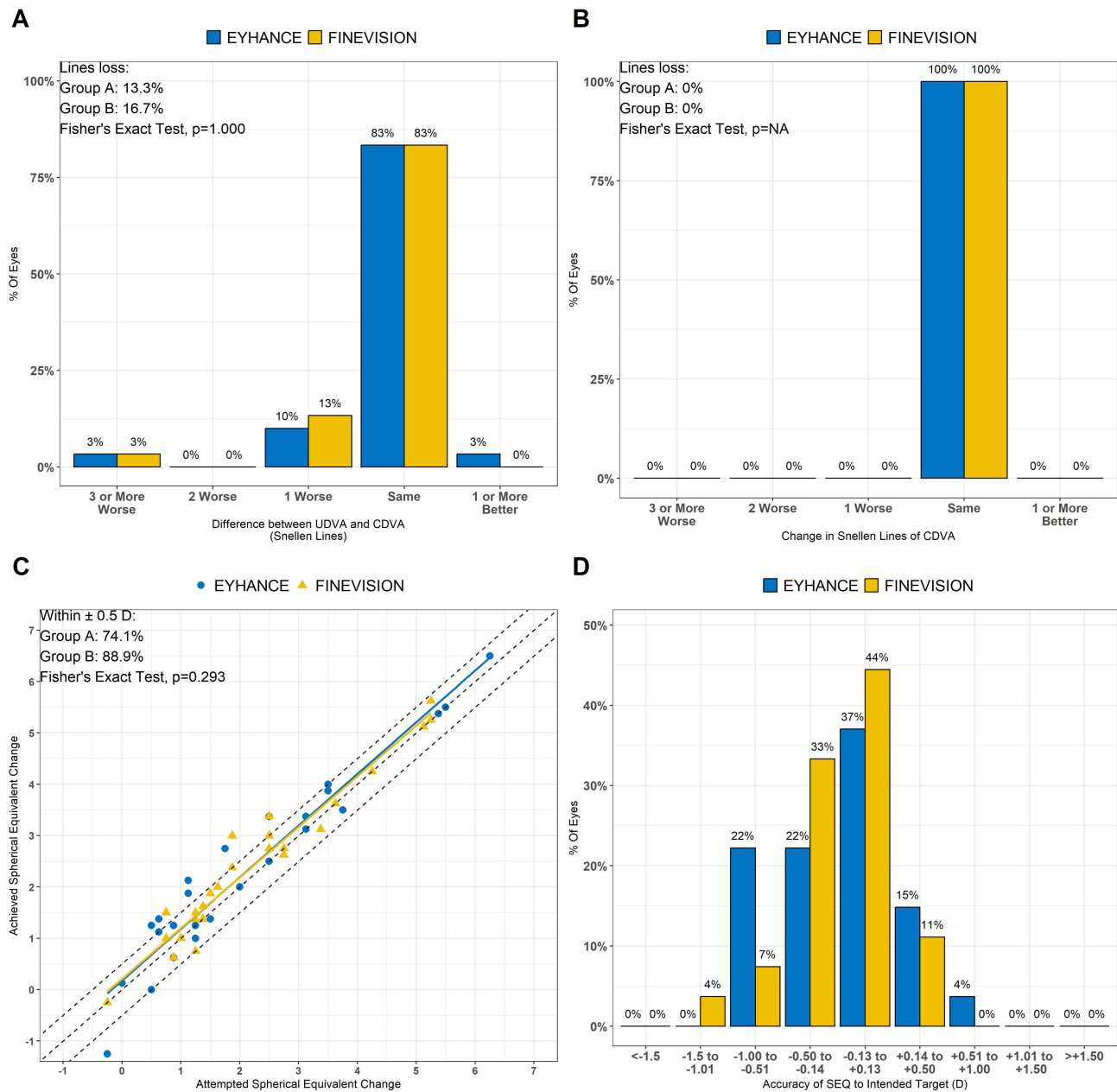


Figure 1 (A) Efficacy by lenses; (B) Safety by lenses; (C) Attempted vs achieved spherical equivalent by lenses; (D), Predictability for ±0.5D and ±1D by lenses.

provide glasses independence and reduce photopic phenomena. Thus, Soscia et al²¹ reported good results when combining a diffractive EDOF (Tecnis Symphony) and a trifocal IOL (Tecnis Synergy) in the dominant and non-dominant eyes, respectively; and Labiris et al²² found that the combination of EDOF Vivity and trifocal Panoptix, forming premium monovision groups, provided good visual, refractive, and subjective results.

In these last 4 papers,^{19–22} uncorrected binocular visual acuity values for the different distances ranged between 0.04 and 0.30 logMAR, in line with our binocular outcomes (between 0.00 and 0.30 logMAR) (Table 2).

However, only the study by Hida²⁰ et al combines a trifocal lens (Synergy) with the same enhanced monofocal IOL that we evaluated in the present study, the Tecnis Eyhance ICB00. They reported favourable clinical results after comparing 2 groups of patients with the trifocal Tecnis Synergy ZFR00V in both eyes (group 1) and a combination of the Synergy in the nondominant eye and the enhanced monofocal Tecnis Eyhance ICB00 in the dominant eye (group 2). Binocular visual outcomes were similar in both groups at all distances; however, subjective satisfaction was higher in

Table 4 Outcomes of Postoperative Spectacle Independence and Satisfaction Questionnaire

A: Patient satisfaction in terms of perceived outcomes for visual acuity at different distances.	
Driving after surgery	N = 23
Very bad	0 (0.0%)
Bad	1 (4.3%)
Medium	3 (13.0%)
Good	7 (30.4%)
Very good	12 (52.2%)
Computer after surgery	N = 23
Very bad	0 (0.0%)
Bad	0 (0.0%)
Medium	2 (8.7%)
Good	11 (47.8%)
Very good	10 (43.5%)
Reading after surgery	N = 23
Very bad	0 (0.0%)
Bad	1 (4.3%)
Medium	3 (13.0%)
Good	10 (43.5%)
Very good	9 (39.1%)
B: Patient satisfaction in terms of night vision.	
Night driving after surgery	N = 23
Stopped driving: I do not feel safe	0 (0.0%)
Much worse than before: I do not feel safe	0 (0.0%)
Worse than before, but it does not bother me	6 (26.1%)
The same or better than before	17 (73.9%)
Night vision after surgery	N = 23
Much worse than before: I do not feel safe	0 (0.0%)
Worse than before, but it does not bother me	1 (4.3%)
The same or better than before	22 (95.7%)
C: Patient satisfaction in terms of spectacle dependence.	
Dependence on spectacles when driving	N = 23
Nearly always	0 (0.0%)
Sometimes	1 (4.3%)
Never	22 (95.7%)

(Continued)

Table 4 (Continued).

Dependence on spectacles when using computer	N = 23
Nearly always	0 (0.0%)
Sometimes	1 (4.3%)
Never	22 (95.7%)
Dependence on spectacles when reading	N = 23
Nearly always	1 (4.3%)
Sometimes	1 (4.3%)
Never	20 (87.0%)
D: Overall satisfaction and percentage of patients who would or would not undergo the same treatment.	
Overall satisfaction	N = 23
Unsatisfied with the result	0 (0.0%)
Less satisfied with the result	1 (4.3%)
Satisfied with the result	10 (43.5%)
Very satisfied with the result	12 (52.2%)
Would repeat surgery	N = 23
No	1 (4.3%)
Yes	21 (91.3%)

group 1 than in group 2, despite a higher incidence of adverse effects such as halos and night glare in the former. The greater satisfaction in the group with trifocal lenses in both eyes could be attributed to the fact that these were not patients with special visual needs, as was the case in our patient group.

These studies show that patients treated with the mix-and-max approach expressed a high level of satisfaction, with few complaints about photic phenomena or quality of vision.^{19–22} Our results, under binocular conditions, revealed levels of subjective satisfaction similar to those found in these studies. Once again, we highlight the importance of subjective satisfaction, since the patients included in our study had higher visual needs and were therefore more demanding than the general population.

The main drawback of the study is the lack of defocus and contrast sensitivity curves. We usually perform these tests in prospective studies and in patients with undesired or unexplained outcomes; therefore, considering the retrospective design of our study, we did not obtain these clinical values. Regarding the fact that the study is multicenter, we must clarify that it has only been carried out in three of our clinics in Spain, and by four of the surgeons who authored the paper. Furthermore, the clinical results and the level of patient satisfaction support the usefulness of this refractive strategy.

In conclusion, this study confirms that the combination of an enhanced monofocal IOL in the dominant eye and a trifocal IOL in the nondominant eye suggests a promising level of patient satisfaction, optimal safety and efficacy results, and sufficient spectacle independence in patients with special visual demands.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically

reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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References

- Ribeiro F, Dick HB, Kohnen T, et al. Evidence-based functional classification of simultaneous vision intraocular lenses: seeking a global consensus by the ESCRS functional vision working group. *J Cataract Refract Surg.* 2024;50(8):794–798. doi:10.1097/j.jcrs.0000000000001502
- Fernández-García JL, Llovet-Rausell A, Ortega-Usobiaga J, et al. Unilateral versus bilateral refractive lens exchange with a trifocal intraocular lens in emmetropic presbyopic patients. *Am J Ophthalmol.* 2021;59:223–253.
- Fernández-García JL, Ortega-Usobiaga J, Mayordomo-Cerdá F, et al. Comparison of patients with emmetropia and presbyopia and different accommodation who undergo unilateral or bilateral implantation of a trifocal IOL. *J Refract Surg.* 2023;39:817–824. doi:10.3928/1081597X-20231018-01
- Bilbao-Calabuig R, Llovet-Rausell A, Ortega-Usobiaga J, et al. Visual outcomes following bilateral implantation of two diffractive trifocal intraocular lenses in 10 084 eyes. *Am J Ophthalmol.* 2017;179:55–66. doi:10.1016/j.ajo.2017.04.013
- Mayordomo-Cerdá F, Ortega-Usobiaga J, Bilbao-Calabuig R, et al. Laser corneal enhancement after trifocal intraocular lens implantation in eyes that previously had photoablative corneal refractive surgery. *J Cataract Refract Surg.* 2022;48:790–798. doi:10.1097/j.jcrs.0000000000000847
- Mayordomo-Cerdá F, Ortega-Usobiaga J, Baviera-Sabater J, et al. Visual and refractive outcomes after implantation of two models of trifocal intraocular lenses in eyes with previous corneal ablation to treat hyperopia. *Eye Vis.* 2023;10:48. doi:10.1186/s40662-023-00366-x
- Mencucci R, Cennamo M, Venturi D, Vignapiano R, Favuzza E. Visual outcome, optical quality, and patient satisfaction with a new monofocal IOL, enhanced for intermediate vision: preliminary results. *J Cataract Refract Surg.* 2020;46:378–387. doi:10.1097/j.jcrs.0000000000000061
- Auffarth GU, Gerl M, Tsai L, et al. Clinical evaluation of a new monofocal IOL with enhanced intermediate function in patients with cataract. *J Cataract Refract Surg.* 2021;47:184–191. doi:10.1097/j.jcrs.0000000000000399
- Micheletti JM, Duncan NB, Hall B. Head-to-head comparison of intermediate vision of two monofocal intraocular lenses. *Clin Ophthalmol.* 2023;17:3983–3990. doi:10.2147/OPTH.S444696
- Jeon YJ, Yoon Y, Kim TI, Koh K. Comparison between an intraocular lens with extended depth of focus (Tecnis Symphony ZXR00) and a new monofocal intraocular lens with enhanced intermediate vision (Tecnis Eyhance ICB00). *Asia Pac J Ophthalmol.* 2021;10:542–547. doi:10.1097/APO.0000000000000439
- Goslings O, Veraart H, van de Laar-Muskens J, Piñero DP. Clinical outcomes with an aspheric monofocal and a new enhanced monofocal intraocular lens with modified optical profile. *Graefes Arch Clin Exp Ophthalmol.* 2023;261:2315–2326. doi:10.1007/s00417-023-06128-8
- Kim DR, Yoon YC, Whang WJ, Hwang HS, Na KS. Ocular parameters associated with visual performance of enhanced monofocal intraocular lens. *BMC Ophthalmol.* 2024;19:24–74.
- Dell SJ, Hannan SJ, Venter JA, et al. Comparative analysis of clinical and patient-reported outcomes of a new enhanced monofocal IOL and a conventional monofocal IOL. *Clin Ophthalmol.* 2024;18:1157–1169. doi:10.2147/OPTH.S456332
- Giglio R, Vinciguerra AL, Presotto M, et al. Visual outcomes and patient satisfaction after bilateral implantation of an enhanced monofocal intraocular lens: a single-masked prospective randomized study. *Int Ophthalmol.* 2024;44(1):112. doi:10.1007/s10792-024-02946-9
- Danzinger V, Schartmüller D, Lisy M, et al. Intraindividual comparison of an enhanced monofocal and an aspheric monofocal intraocular lens of the same platform. *Am J Ophthalmol.* 2024;261:95–102. doi:10.1016/j.ajo.2023.11.006
- Fernandes MC, Nunomura CY, Messias A. Visual performance and photic disturbances with diffractive and nondiffractive EDOF intraocular lenses using mini-monovision: randomized trial. *J Cataract Refract Surg.* 2024;50:153–159. doi:10.1097/j.jcrs.0000000000001330
- Sandoval HP, Lane S, Slade S, Potvin R, Donnenfeld ED, Solomon KD. Extended depth-of-focus toric intraocular lens targeted for binocular emmetropia or slight myopia in the nondominant eye: visual and refractive clinical outcomes. *J Cataract Refract Surg.* 2019;45:1398–1403. doi:10.1016/j.jcrs.2019.05.019
- Savini G, Balducci N, Carbonara C, et al. Functional assessment of a new extended depth-of-focus intraocular lens. *Eye.* 2019;33:404–410. doi:10.1038/s41433-018-0221-1
- Kim JW, Eom Y, Park W, et al. Comparison of visual outcomes after two types of mix-and-match implanted trifocal extended-depth-of-focus and trifocal intraocular lenses. *Graefes Arch Clin Exp Ophthalmol.* 2022;260:3275–3283. doi:10.1007/s00417-022-05710-w
- Hida WT, Moscovici BK, Cortez CM, et al. Comparison of visual outcomes of bilateral dual-technology diffractive intraocular lens vs blended enhanced monofocal with dual-technology intraocular lens. *J Cataract Refract Surg.* 2024;50:401–406. doi:10.1097/j.jcrs.0000000000001374
- Soscia WL, DeRojas JO, Mathews PM, et al. Clinical performance after implantation of an EDOF intraocular lens in the dominant eye and a presbyopia-correcting intraocular lens in the nondominant eye. *J Cataract Refract Surg.* 2024;50:578–584. doi:10.1097/j.jcrs.0000000000001412
- Labiris G, Panagis C, Ntonti P, Konstantinidis A, Bakirtzis M. Mix-and-match vs bilateral trifocal and bilateral EDOF intraocular lens implantation: the spline curve battle. *J Cataract Refract Surg.* 2024;50:167–173. doi:10.1097/j.jcrs.0000000000001336

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