

LIBERTY<sup>®</sup>

# PRESBYOPIA CORRECTION

FOR LONG-TERM  
VISUAL COMFORT



● EPS 2.0

MEDICENTUR



*"An exceptionally good platform and optic that generates more patient satisfaction in terms of defocus curves and perceived dysphotopsia symptoms. I would not change a thing about this IOL."*

**J. Fernández Pérez MD, PhD, Spain**



*"The high level of patient satisfaction with minimal postoperative visual symptoms proves that it is possible to reach outstanding vision with a minimum of diffractive arrays."*

**J. Győry, MD, Hungary**



*"Clinical evidence of a prospective randomized study catapulted Liberty into the high quality trifocal group of IOLs available on the market."*

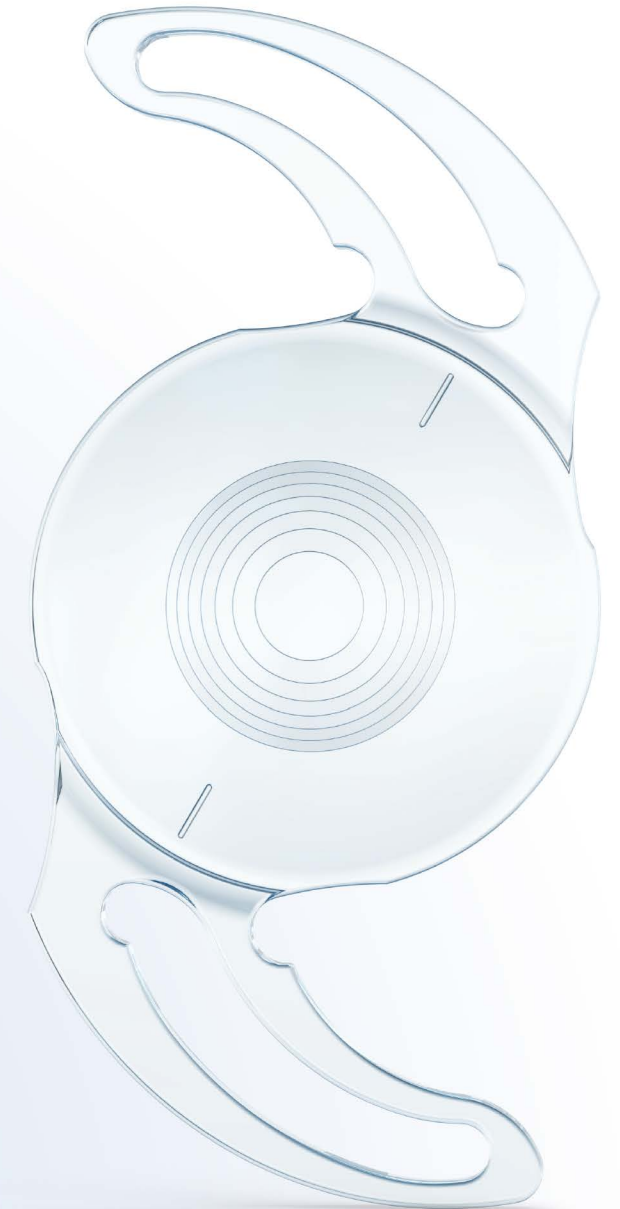
**E. Van Acker MD, Belgium**

## Ensuring long-term visual comfort

Modern age cataract and/or presbyopia patients are increasingly interested in spectacle independence by a Premium IOL ensuring a full range of vision.

The preloaded Liberty trifocal IOLs (677CMY/677CMTY) are based upon innovative optical principles and are perfectly adapted to ocular physiology.

**State-of-the-Art solutions in Material, Design and Optics satisfy the patients' functional needs and optimize their visual quality.**



● **EPS 2.0** makes the difference

# Innovative optic - Fine-tuning light interference

By using the proprietary **Elevated Phase Shift (EPS) technology** that causes constructive interference at the wavefront arriving at the intermediate region, we can use only one diffractive order to create two additional diffractive focal points.

Through EPS we can create a third focal point for a **homogenous intermediate peak** with only seven rings but still provide virtually **uncompromised vision at near and far distances**.

In addition, by incorporating apodization, the Liberty IOL is designed to achieve **optimal light intensity distribution between the far and additional focal points** and reduce light losses secondary to pupil size.

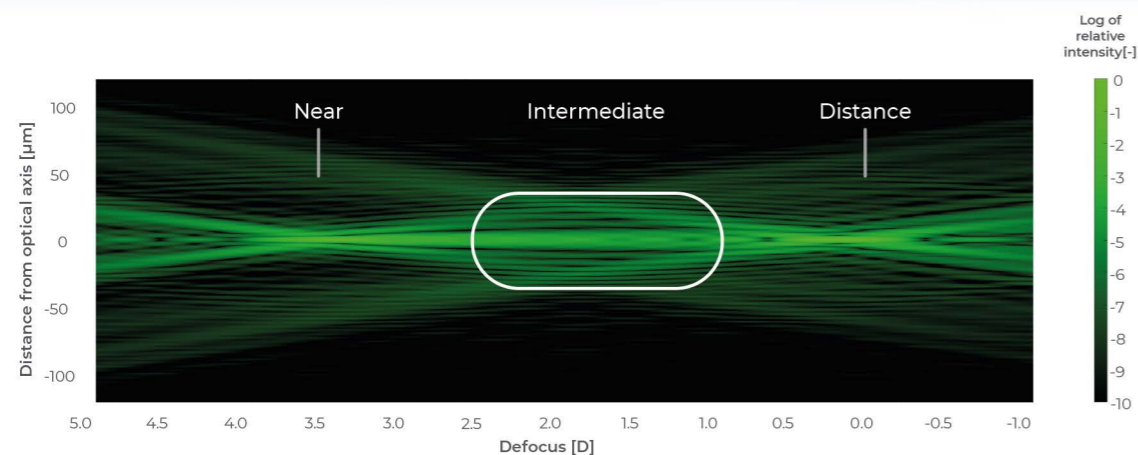


Figure 1. Effective light intensity pattern among the three focal points on PSF (Point Spread Function) Maps in ISO Model Eye. Simulations of theoretical designs constructed by the Medicontur Research Department with Zemax Optic Studio for 3 mm of Pupil Diameter with  $\lambda = 546\text{nm}$ .

# Dynamic light distribution

**LIBERTY IOLs** achieve trifocal performance with **7 steps** in a precise diffractive array within a **3 mm diameter** leaving a **75% refractive** lens surface without any optical compromise.

We have created an IOL that can distribute **light intensity according to where it is most needed** depending on the size of the pupil for different vision tasks.

Hence, LIBERTY IOLs are strongly **pupil-dependent** using the near triad reflex which implies miosis under accommodation.

LIBERTY provides the **highest light distribution** in the near focus under accommodation and the highest for far vision under scotopic conditions.

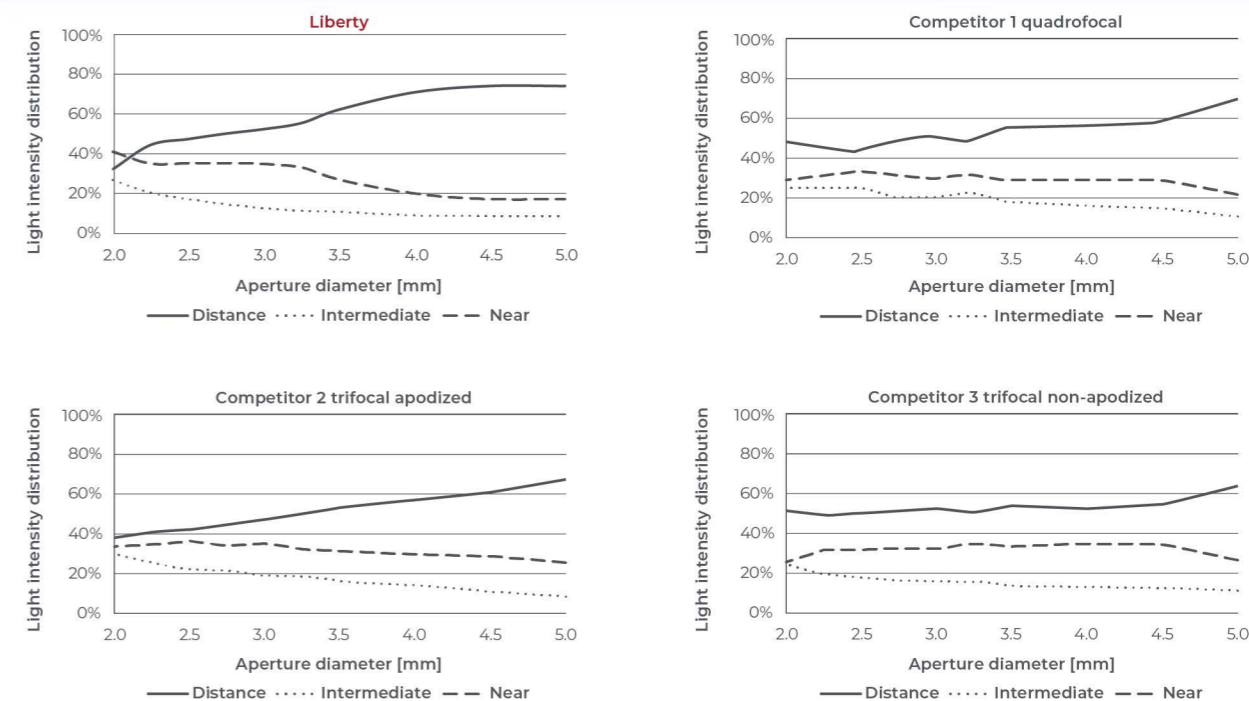


Figure 7. Useful light distribution (%) of the Liberty IOL and three competitors depending on the aperture [mm] \*. \*Based on Zemax simulation results, PMTF calculation method and on Strehl ratio calculated from Zemax simulated MTF values

# Outstanding visual outcomes

## Predictable refractive results – minimal residual refractive errors

The result in the majority of eyes is close to the refractive target (emmetropia). Clinical results confirm that the IOL is located in the effective lens position.<sup>1</sup>

## Trifocal performance

Postoperative distance, intermediate and near visual acuities, and also the area under the visual acuity defocus curve confirm clinical trifocality and validate Medicontur's unique Elevated Phase Shift concept in the development of trifocality.<sup>1-4</sup>

## Complete spectacle independence

Complete spectacle independence is the achievable target for all patients, provided that preoperative astigmatism is also corrected, and the patient has no further ocular pathologies. Multiple clinical studies affirm that almost all patients implanted with the Liberty IOL became spectacle independent.<sup>15</sup>

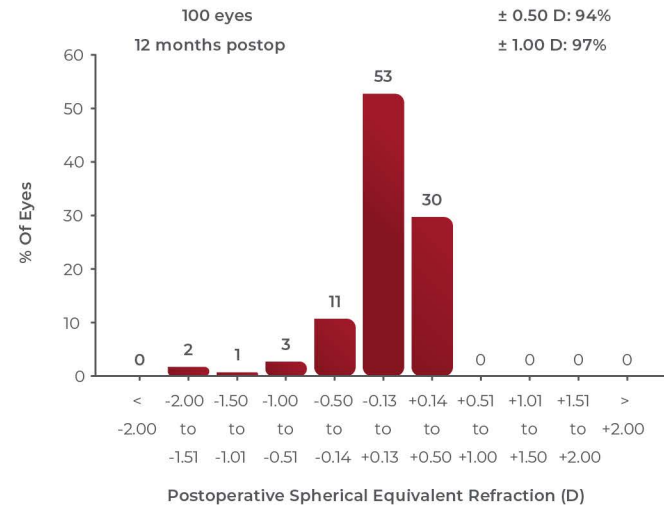


Figure 2. Residual spherical equivalent refraction after Liberty 677MY-implantation 12 months postoperatively.<sup>1</sup>

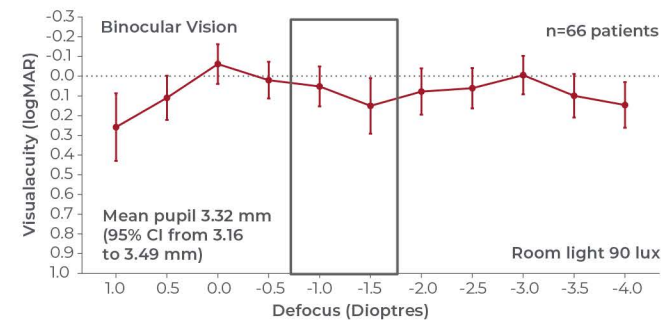


Figure 3. Binocular defocus curve of 66 eyes after 3 months follow-up.<sup>2</sup>

# Minimal Undesired Light Phenomena

The EPS technology of the Liberty optic produces minimal out-of-focus light effects around the far focal point. This results in a sharp and detailed image on the retina.

The Liberty IOLs have lower light distortion index (LDI) values compared to other multifocal IOLs on the market. The LDI of the improved EPS 2.0 model is even lower than that of a monofocal lens. These findings project a superior visual experience.

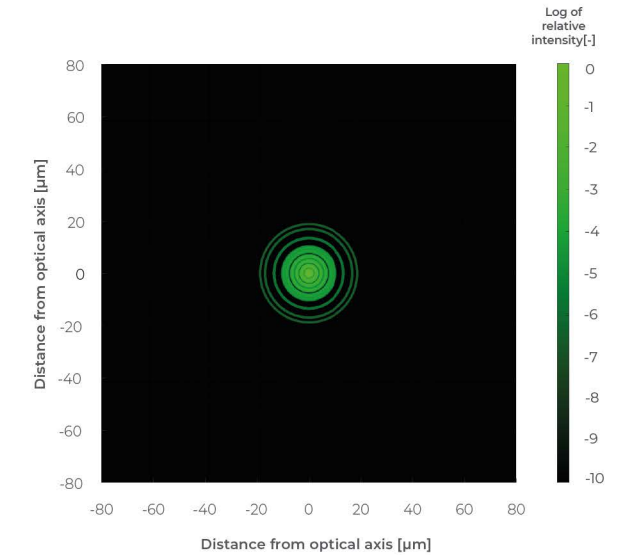


Figure 4. Effective light intensity pattern at the far focal point on front PSF Maps in ISO Model Eye simulated in scotopic conditions.

Author	Follow-up (months)	Investigated IOL model	LDI % Monocular
Brito P., 2015.	3-14 months	Tecnis ZCB00 (Monofocal)	23.9
		AT LISA tri 839M	46.9
		AT LISA 909MP (Bifocal Toric)	53.6
Alió J., 2018.	6 months	AcrySof IQ Panoptix	36.8
Vargas V., 2020.	12 months	LENTIS MPlus +1.5 / +3.0D	20.6 / 26.5
Fernández J., 2021. ESCRS	3 months	Liberty EPS 1.0	30.0 ± 7.79
		Liberty EPS 2.0	14.2 ± 6.55

## What does EPS mean for your patients?

- Excellent contrast sensitivity
- Visual comfort in low light conditions
- Less visual disturbances

# Outstanding visual quality

## Excellent contrast sensitivity even in low light conditions

Significant improvement in contrast sensitivity could be observed in all light conditions compared to the preoperative status ( $p < 0.0001$ ). Contrast sensitivity results show further improvement with time and are stable in the long term.<sup>6</sup>

## Reading speed identical to that with a monofocal IOL

The maximum reading speed of patients with Liberty 677MY IOLs is similar to that measured in patients implanted with the monofocal IOL model of the MediconTur Bi-Flex platform.<sup>7</sup>

## Low level of dysphotopsia

Visual disturbances are rarely reported, mostly mild if present and acceptable to the patients.<sup>1,3</sup>

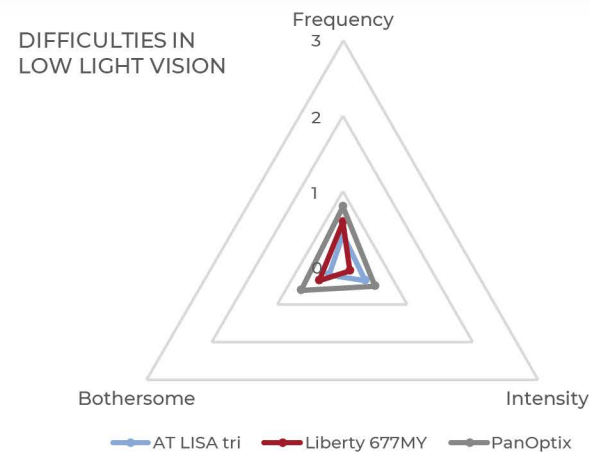
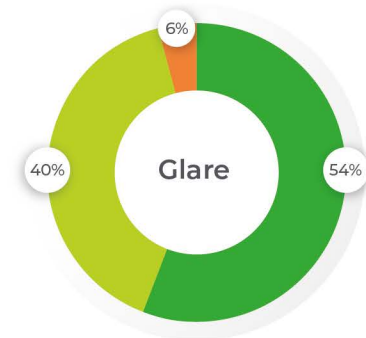
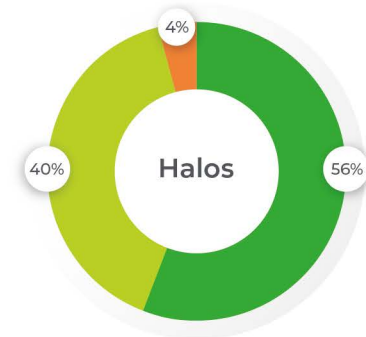


Figure 6. Evaluation of difficulties in low light conditions. Data points represent the mean responses (0: no difficulties; while 3 major difficulties).<sup>16</sup>



None Mild Moderate+Severe

Figure 6. Percentage of patients with dysphotopic phenomena (3 months post-op; 50 patients/100 eyes). The majority of patients either does not experience or can easily tolerate dysphotopsia.<sup>1</sup>

*“A trifocal with a very low level of dysphotopic phenomena, basically on EDOF-level.”*

J. Fernández Pérez MD, PhD, Spain

# Excellent visual function for everyday activities

The most common daily activities are performed without major difficulties – regardless of the needed visual distance.<sup>8</sup> The majority of the patients do not require further vision correction to perform their everyday tasks.<sup>8</sup>

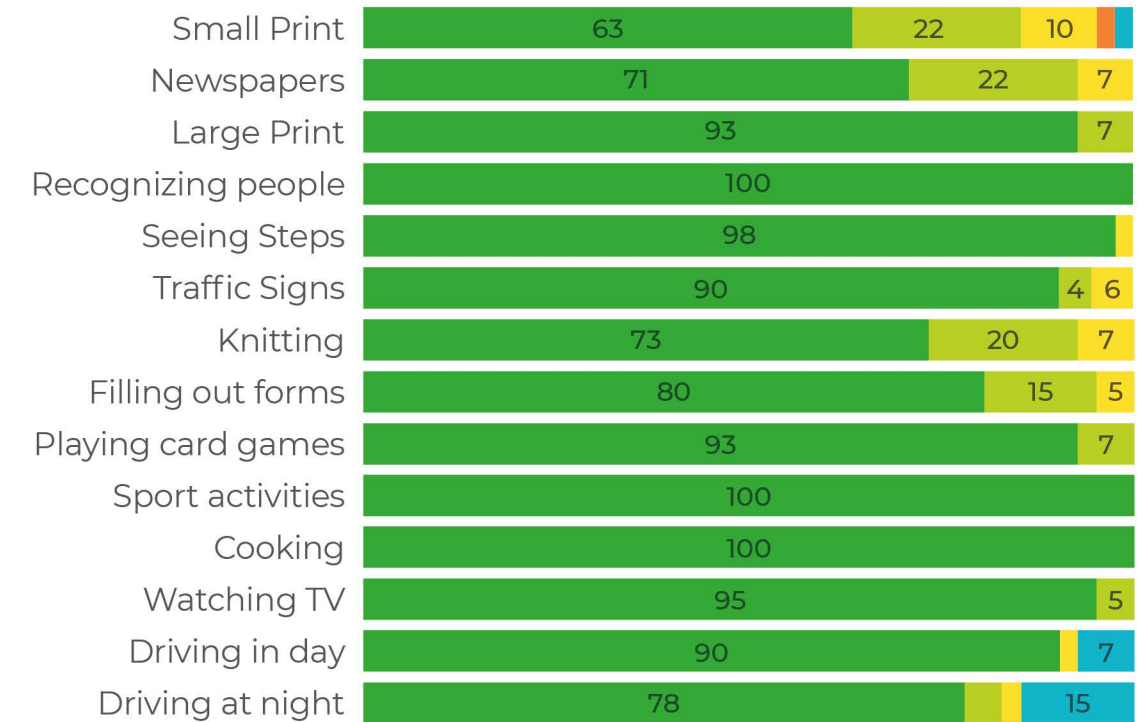
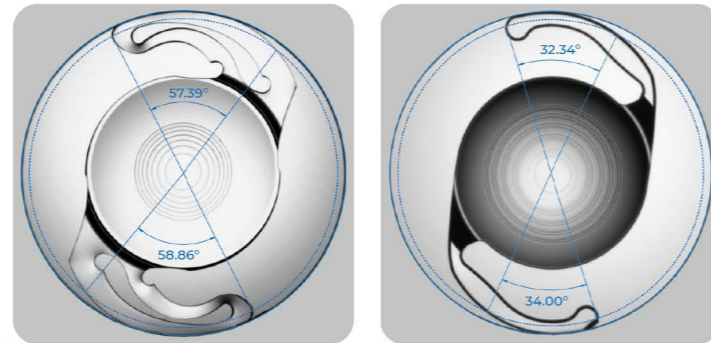


Figure 8. Postoperative assessment of visual lifestyle activities show easy performance of all activities (percentage of 41 subjects / 12 months).<sup>8</sup>

# Conscious IOL design for long-term visual comfort & safety

The double C-loop haptics have a **large contact angle** (116.25°) with the capsular bag equator, which allows proper positioning but also flexibility. This confers stability through resistance against compressive forces from capsular bag contraction. This **optimal combination of stability and flexibility** is the fundament of a good toric platform.

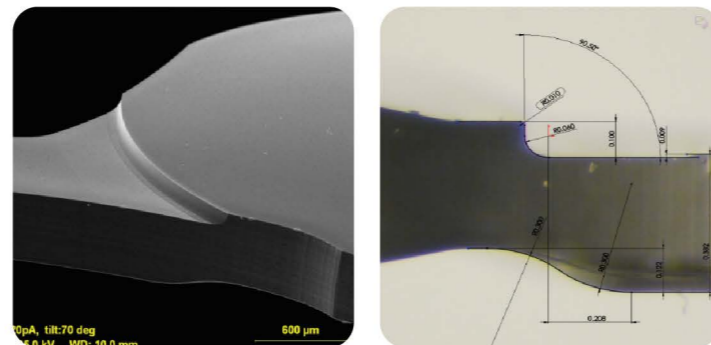


Liberty 677MY

PanOptix

Figure 9. Experimental simulation of the contact angle between different IOLs and the wall of the capsular bag with a diameter of 10 mm (Courtesy of the MediconTur R&D Department, 2022)

The Liberty optic has a **360° sharp square edge** ( $\leq 10 \mu\text{m}$ ) including the optic-haptic junction zone, effectively **reducing the development of Posterior Capsule Opacification (PCO)**.<sup>1,4,9-12</sup>



# Stable refractive and visual outcomes

## Refractive stability without significant shift

Refractive outcomes achieved by the third postoperative month are shown to be stable in the long-term (2 to 5 years). No significant hyperopic or myopic shift could be observed.<sup>1,4</sup>

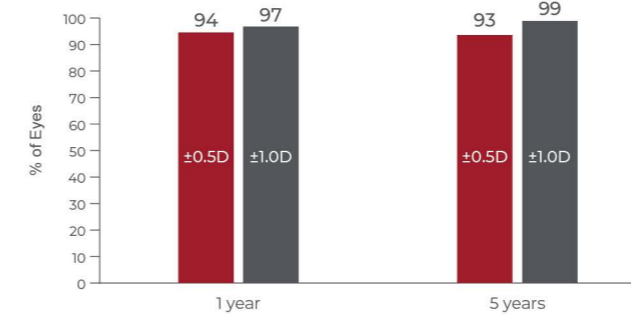


Figure 10. Postoperative spherical equivalent refraction is stable in the long-term.<sup>16</sup>

## High rotational stability

Off-axis rotation was within 5° in all eyes, in all relevant clinical studies.<sup>9</sup>

## Stable visual outcomes

Visual acuities measured and defocus curves plotted in different time points following implantation are identical.<sup>1,4</sup>

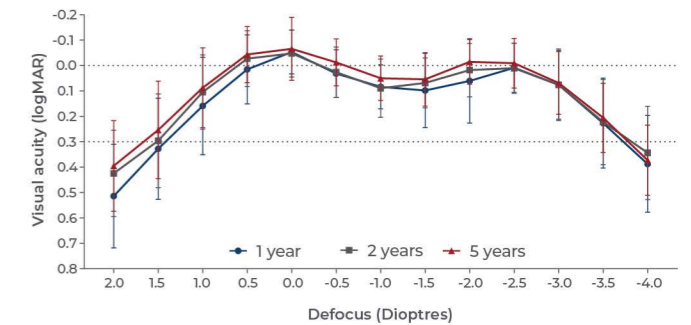


Figure 11. Binocular defocus curves of 100 eyes after 1, 2 and 5 years follow-up show identical course.<sup>6</sup>

## Low rate of PCO and Nd:YAG capsulotomy

The majority of the patients did not need Nd:YAG laser capsulotomy within the first postoperative year.<sup>1,4,9-12</sup>

# Maximized visual experience with simultaneous astigmatism-correction

The Liberty<sup>®</sup> IOLs are also available with toric optics in order to treat preoperative corneal astigmatism. The efficient cylindrical correction helps in:



Achieving the best possible visual outcomes<sup>14,15</sup>



Lowering the levels of dysphotopic sensations<sup>14,15</sup>



Achieving real spectacle independence<sup>14,15</sup>



# Improved refractive and visual outcomes with Liberty Toric

The Liberty Toric efficiently reduces preoperative corneal astigmatism. The refractive outcomes are predictable and accurate.<sup>14</sup>

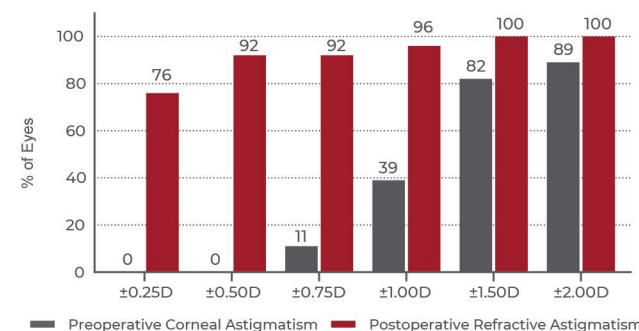


Figure 12. Cumulative histogram of preoperative corneal and postoperative refractive astigmatism measured one year postoperatively at the corneal plane.<sup>14</sup>

Simultaneous presbyopia- and astigmatism correction result in exceptionally good vision at all distances.<sup>14</sup>

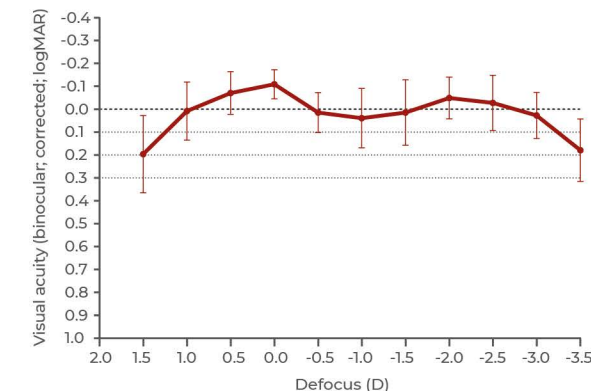


Figure 13. Binocular defocus curve (1 year follow-up, 14 patients) confirms excellent visual outcomes at all examined distances after the implantation of the trifocal toric Liberty 677MTY IOL.<sup>14</sup>

The Liberty Toric efficiently reduces preoperative corneal astigmatism. The refractive outcomes are predictable and accurate.<sup>14</sup>

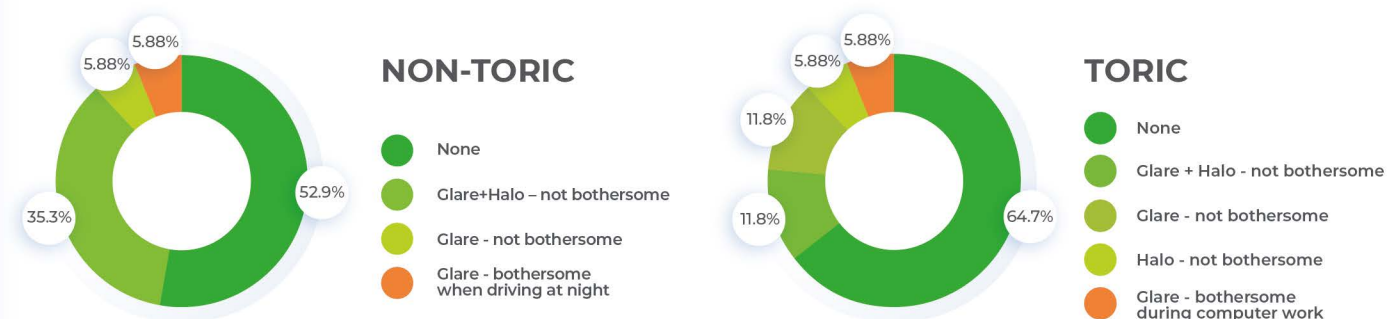


Figure 14. Astigmatism-correction during cataract surgery (Liberty Toric 677MTY) efficiently reduces the frequency and intensity of dysphotopic sensations, compared to that observed with the non-toric model.<sup>15</sup>



### Indications for the Liberty® IOLs

- Motivated patient
- Who wishes to get rid of their spectacles
- Has no other ocular diseases
- Good tear-film quality (no dry-eye syndrome)
- Physiological pupil size and function
- Hypermetropic patients might be good candidates

#### BUT

- Setting realistic expectations is crucial
- Chair-time must be appropriate
- Communication



### Be careful in case of...

#### Relative contraindications:

- Patients after corneal laser operations
- Pseudoexfoliation
- Uncontrolled glaucoma
- Uveitis
- Zonular instability
- Amblyopia
- Presence of or risk of macular or corneal changes developing later in life
- Reduced refractive predictability due to prior corneal refractive surgery
- Challenges determining preferred working distances for the patient



### Consider a different IOL in case of...

#### Absolute contraindications for multifocal IOLs:

- Corneal diseases and central scars
- Irregular astigmatism
- Retinal disease
- Age-related macular degeneration (AMD), macular changes (ERM)
- Abnormal pupils

#### Further reading

**1. Györy JF**, Madár E, Srinivasan S. Implantation of a diffractive-refractive trifocal intraocular lens with centralized diffractive rings: Two-year results. *J Cataract Refract Surg.* 2019;45(5):639-646. **2. Fernández J**, Rodríguez-Vallejo M, Martínez J, Tauste A, Piñero DP. Biometric factors associated with the visual performance of a high addition multifocal intraocular lens. *Curr Eye Res.* 2018;43(8):998-1005. **3. García-Bella J**, Ventura- Abreu N, Morales-Fernández L, Talavero-González P, Carballo-Álvarez J, Sanz-Fernández JC, Vázquez-Moliní JM, Martínez-de-la-Casa JM. Visual outcomes after progressive apodized diffractive intraocular lens implantation. *Eur J Ophthalmol.* 2018 May;28(3):282-286. **4. Nagy Zs**, Kiss H, Juhász É, Sándor GL, Kránitz K, Dunai ÁF. The impact of intraocular lens design on refractive stability and long-term visual outcome – a comparative evaluation of two different presbyopia-correcting IOLs. (Under publication). **5. Tapia A**, Cervantes-Costa C, Gonzales RS. Logrando la satisfacción en trifocalidad. Nuevas opciones. Presented at the Mexican Ophthalmology Congress in 2019. **6. Györy JF**, Srinivasan S, Madár E, Balla L. Long-term performance of a diffractive-refractive trifocal IOL with centralized diffractive rings: 5-year prospective clinical trial. *J Cataract Refract Surg.* 2021 Oct 1;47(10):1258-1264. **7. Law EM**, Aggarwal RK, Buckhurst H, et al. Visual function and subjective perception of vision following bilateral implantation of monofocal and multifocal intraocular lenses: randomized controlled trial [published online ahead of print, 2020 Apr 15]. *J Cataract Refract Surg.* 2020;10.1097/jjcrs.0000000000000210. doi:10.1097/jjcrs.0000000000000210. **8. Fernández J**. Safety and Efficacy Criteria for Refractive Lens Exchange. Presented at FacosElche in February 2023, Elche, Spain. **9. Bachernegg A**, Rückl T, Strohmaier C, Jell G, Grabner G, Dexl AK. Vector Analysis, Rotational Stability, and Visual Outcome After Implantation of a New Aspheric Toric IOL. *J Refract Surg.* 2015 Aug;31(8):513-520. **10. Dexl A**. Visual Outcome, Patient Satisfaction and Spectacle Independency after Implantation of Progressive Bi-Flex M. Final Result of a Multicentric study. Presented at the ESCRS 2014 Congress, in London, UK. **11. Gerbec H**. First results with Medicontur Bi-Flex 677AB 1.8 hydrophilic aspheric IOL. Presented at the WESCRS Congress in 2014, in Ljubljana, Slovenia. **12. Vámosi P**. Nd:YAG-laser capsulotomy rates in 176 eyes 5 years after phacoemulsification. Presented at the ESCRS Congress in 2010, Paris, France. **13. Györy JF**, Madár E, Balla L, Srinivasan S. Evaluation of the long-term performance of the trifocal intraocular lens with centralized diffractive rings: five-year results. [Under publication]. been confirmed by several clinical investigations published during the past few years. **14. Nováček LV**, Němcová M, Sičová K, Tyx K, Rozsival P, Němčanský J, Studený P. Simultaneous presbyopia and astigmatism correction with a novel trifocal toric intraocular lens—A one-year follow-up. *Journal of Clinical Medicine.* 2022; 11(14):4194. <https://doi.org/10.3390/jcm11144194> **15. Harrisberg B**. Comparison of refractive and visual outcomes in cataract patients implanted with either premium primary IOLs or with dual implantation approach. Presented in the RANZCO NSW Congress in 2020, Newcastle, NSW, Australia. **16. Serdiuk V**, Ustyomenko S, Fokina S, Ivantsov I. Comparison of three different presbyopia-correcting intraocular lenses. *Rom J Ophthalmol.* 2020; 64(4):364-379.

# LIBERTY®

LESS IS MORE

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