



## Clinical evidence supporting the predictable and high quality visual outcomes, trifocal performance, and long-term stability of the Liberty 677M(T)Y IOL family

- In recent years cataract surgery has gradually become from a simple surgical removal of the cataractous lens into an option for all-round refractive correction. Complete spectacle independence with high quality vision in all light conditions have been formulated an ever-increasing demand from the patients, while surgeons aim to find an intraocular lens with predictable refractive and visual outcomes and long-term stability.
- We are very pleased to share that the predictable surgical results, high quality trifocal clinical performance, and long-term stability of our **Liberty™ Trifocal** intraocular lenses have been confirmed by several clinical investigations released during the past few years.

# Predictable visual outcomes

## ■ Predictable refractive results – minimal residual refraction.

The majority of eyes result close to the refractive target (usually emmetropia). Ninety-four percent (94%) of eyes had a residual spherical refraction (SEQ) of not more than  $\pm 0.5$  D; while 97% resulted within 1.0 D from the refractive target. These results confirm that the IOL sits in the effective lens position, and also approve the efficiency of the MediconTur IOL Optimizer IOL-calculation application<sup>1</sup>

## ■ Trifocal performance.

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

## ■ Complete spectacle independence.

Complete spectacle independence is a realistic promise for any patient, provided that preoperative astigmatism is also corrected, and the patient has no further ocular pathologies. Multiple clinical studies have reported that 100% of their patients implanted with the Liberty lens became independent from their spectacles.<sup>1,5</sup>

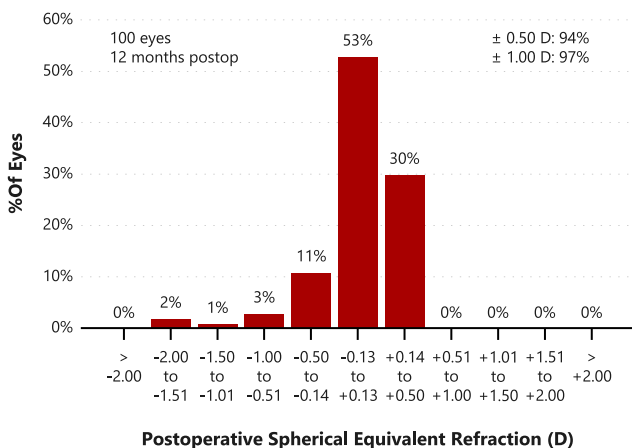


Figure 1. Residual spherical equivalent refraction after Liberty 677MY-implantation 12 months postoperatively. (Györy, 2019)

	Uncorrected VA (logMAR)	Corrected VA (logMAR)
Distance (UDVA)	0.01 ± 0.09	-0.02 ± 0.03
Intermediate (UIVA)	0.05 ± 0.11	-0.01 ± 0.07
Near (UNVA)	0.08 ± 0.08	0.03 ± 0.06

Table 1. Monocular visual acuities measured on the ETDRS chart in photopic conditions, three months following the binocular implantation of the Liberty 677MY IOL. (Györy, 2019)

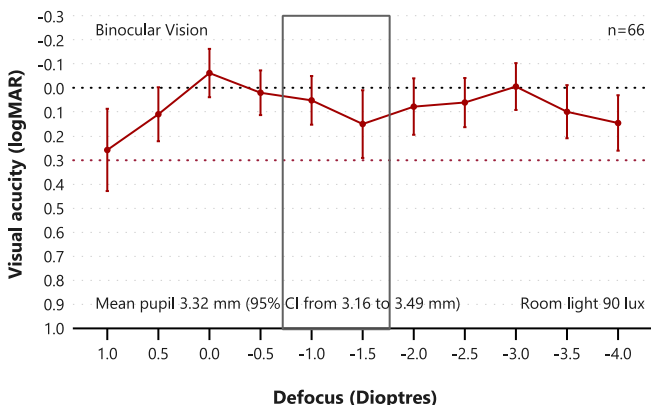


Figure 2. Binocular defocus curve of 66 eyes after 3 months follow-up. (Fernández, 2018)

	Defocus Range (Dioptres)	AUC (Mean ± SD)
Total AUC	+1.0 to -4.0	2.08 ± 0.74
Far AUC	+0.5 to -0.5	0.57 ± 0.17
Intermediate AUC	-1.0 to -1.5	0.16 ± 0.09
Near AUC	-2.0 to -4.0	0.81 ± 0.29

Table 2. Area under the curve measurements above 0.3 logMAR baseline. (Fernández, 2018)

# Outstanding Visual Quality

## ■ Excellent contrast sensitivity even in low light conditions.

Significant improvement of 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. During the 5-year follow-up period results are stable at the level achieved by the third postoperative month.<sup>6</sup>

## ■ Reading speed identical to that with a monofocal IOL.

Maximum reading speed of patients with Liberty 677MY IOLs is similar to that measured in patients implanted with the monofocal IOL-model of the Mediconcur Bi-Flex platform:  $157.1 \pm 27.7$  and  $164.7 \pm 30.3$  words per minute, respectively ( $p = 0.555$ ).<sup>7</sup>

## ■ Low level of dysphotopsia.

Visual disturbances are rarely reported, their severity is tolerable for the patients. Clinical results confirm the optical bench measurements which had shown that the seven diffractive rings of the Liberty IOLs provided sharp image on the retina without remarkable light scattering.<sup>1,3</sup>

## ■ Highly satisfied patients.

The majority of the patients are highly satisfied with their vision at all distances, and with their quality of life after their cataract surgery. Most common daily activities are performed easily, regardless of the requirement of distance, intermediate or near vision skills.<sup>1-3,5</sup>

## ■ Maximized visual experience with astigmatism-correction.

The Liberty 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, lowers the level of dysphotopic sensations, and enhances to achieve real spectacle independence.<sup>8</sup>

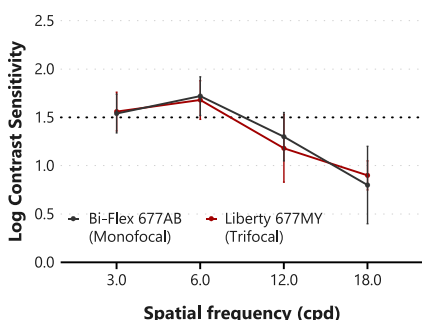


Figure 3. CSV-1000 contrast sensitivity measurements have identical results in eyes implanted with either the monofocal Bi-Flex 677AB or the Liberty 677MY IOL with the same material and design. (Law, 2020)

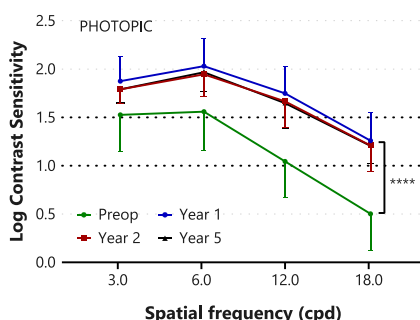
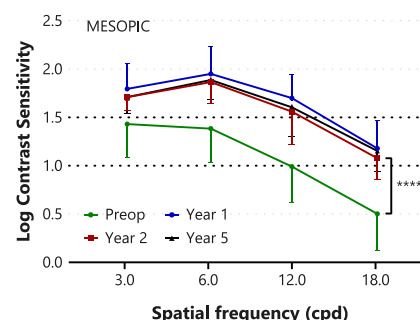


Figure 4-5. Significant improvement of contrast sensitivity (CS) could be observed in all light conditions, compared to the preoperative status ( $p < 0.0001$ ). CS results show further improvement with time (statistically significant) (Györy, 2019)



DYSPHOTOPIC PHENOMENA	Percentage of patients	Likert scale
Type 1 (Glare)	35.71	0.20 ± 0.44
Type 2 (Halo)	42.86	2.75 ± 0.75
Type 3 (Starburst)	14.29	1.00 ± 0.02
Type 4 (Combined)	13.28	2.02 ± 0.34
Type 5 (Halo + Starburst)	7.14	2.50 ± 0.05

Table 3. Percentage of patients with dysphotopic phenomena and values in the Likert Scale (3 months post-op; 25 patients/ 50 eyes) (García-Bella, 2018)  
0=no trouble; 1=minimal trouble; 2=moderate trouble; 3=considerable trouble; 4=overwhelming trouble

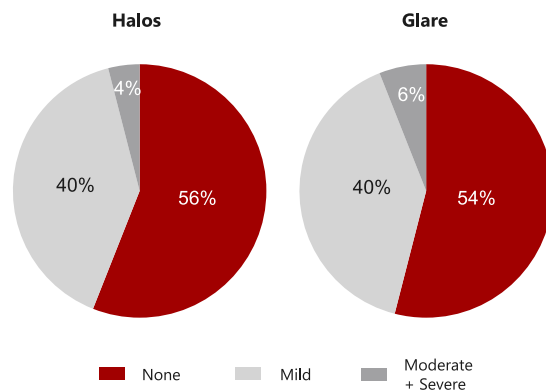


Figure 6. Percentage of patients with dysphotopic phenomena (3 months post-op; 50 patients/ 100 eyes). The majority of patients either does not experience, or can easily tolerate dysphotopsia. (Györy, 2019)

# Stability in the long-term

## ■ 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. This also confirms that the Bi-Flex design of the Liberty IOLs ensures stability in the effective lens position, within the capsular bag.<sup>1,4</sup>

## ■ Stable visual outcomes.

Distance, intermediate and near visual acuities measured one to five years following IOL-implantation are similar to those obtained three months post-surgery. Similarly, the course of visual acuity defocus curves and the area under the curve results are also identical in different time points.<sup>1,4</sup>

## ■ High rotational stability during the whole investigated period.

The Bi-Flex double-loop haptics ensure large contact angle ( $2 \times 88.8^\circ$ ) with the wall of the capsular bag, which is the fundament of a good toric platform. No patient required a secondary procedure because of rotational instability or torus misalignment in any of the cohorts investigating the Medicontur Bi-Flex Toric IOLs. Off-axis rotation was within  $5^\circ$  in all eyes, in all relevant clinical studies.<sup>9,10</sup>

## ■ Low rate of PCO and Nd:YAG capsulotomy.

Thanks to the  $360^\circ$  continuous square edge design of the Liberty lenses, the development of posterior capsule opacification could be efficiently reduced, and the majority of the patients did not need Nd:YAG laser capsulotomy within the first postoperative year.<sup>1,4,9-13</sup>

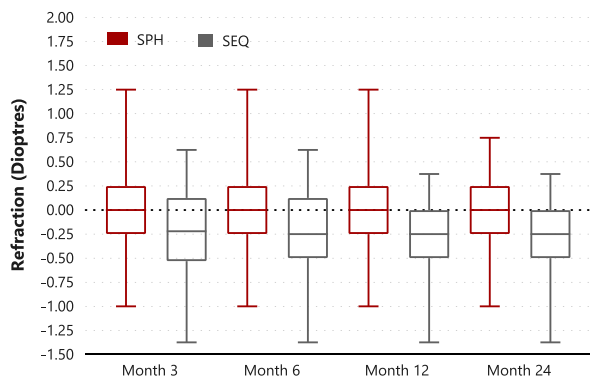


Figure 7. Postoperative sphere (SPH) and spherical equivalent refraction (SEQ) are shown to be stable in time. (Nagy; 2020)

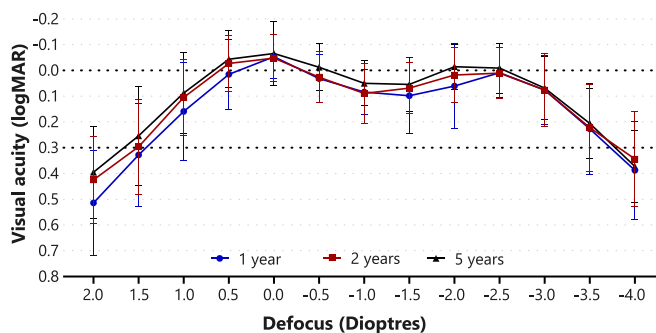


Figure 8. Binocular defocus curve of 100 eyes after 12 and 24 months follow up show identical course. (Györy; 2019)

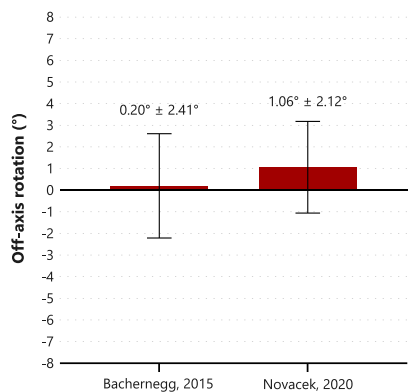


Figure 9. Majority of the Bi-Flex Toric IOLs maintain surgical position post-operatively. Off-axis rotation is minimal. (Bachernegg, 2015; Novacek; 2020)

Study	Eyes / Patients	Follow-up (years)	PCO (eyes)	PCO (%)
Dexl, 2014	50 / 25	0.5	0	0
Bachernegg, 2015	30 / 20	1	0	0
Györy, 2019	100 / 50	1	0	0
Nagy, 2020	Liberty: 48 / 24 ReStor: 46 / 23	2	11 13	22.9 28.3
Gerbec, 2014	856 / 642	2.5	9	1.05
Vámosi, 2010	176 / 151	5	15	14.4
Györy, 2020	82 / 41	5	18	21.9

Table 4. Incidence of PCO following Medicontur Bi-Flex IOL-implantation.

**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 G, Gonzales RS. Logrando la satisfacción en trifocalidad. Nuevas opciones. Presented at the Mexican Ophthalmology Congress in 2019. 6. Györy JF. Long-term evaluation of contrast sensitivity prior to and after the implantation of the Liberty 677MY trifocal intraocular lens. Presented as an e-poster at the ESCRS Congress in 2019, in Paris, France. 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. Harrisberg B. Visual outcomes with supplementary multifocal sulcus IOLs. Presented at the RANZCO Congress in 2020, in Brisbane, Australia. 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. Nováček LV, Nemcová M, Týx K, Studený P, Rozsival P. Evaluation of refractive and visual outcomes, as well as astigmatism-correcting efficiency and rotational stability of a double-loop haptic toric intraocular lens - a one-year follow-up. [Under publication]. 11. Dexl A. Visual Outcome, Patient Satisfaction and Spectacle Dependency after Implantation of Progressive Bi-Flex M. Final Result of a Multicentric study. Presented at the ESCRS 2014 Congress, in London, UK. 12. Gerbec H. First results with Medicontur Bi-Flex 677AB 1.8 hydrophilic aspheric IOL. Presented at the WESCRS Congress in 2014, in Ljubljana, Slovenia. 13. Vámosi P. Nd:YAG-laser capsulotomy rates in 176 eyes 5 years after phacemulsification. Presented at the ESCRS Congress in 2010, Paris, France.