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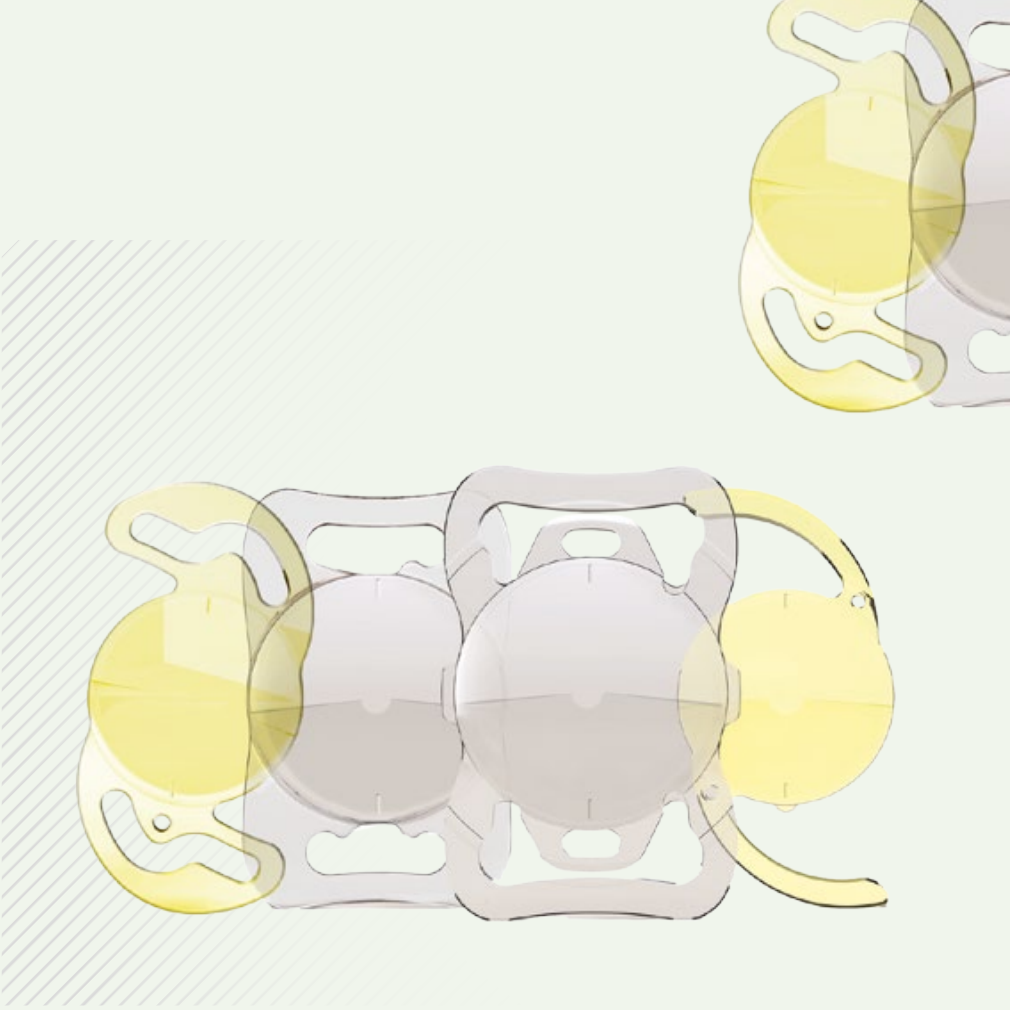
NORTH AMERICA

One Lens Is Never Enough!

From monofocal to full – or extended range of vision

By Andreas F. Borkenstein, MD



Gone are the days of one-size-fits-all IOLs. With a growing arsenal of optical options and different marketing claims by the manufacturers – enhanced monofocal, EDOF, multifocal, toric, sectorial – the modern cataract surgeon faces a visual buffet. However, with choice comes responsibility: knowing the subtle differences between lens designs is key to making the best possible match for each patient's visual lifestyle. This article breaks down the categories, brings clarity to the optical landscape, and guides you through the world of premium IOLs – illustrated by the diverse portfolio of Teleon Surgical.

"This makes it easier to match an IOL to real-life vision goals, while at the same time reminding surgeons that every class has its own balance of benefits, challenges, and potential side effects."

Over the past decade, intraocular lens (IOL) categorization has shifted dramatically, largely pushed by higher patient demands and rapid technology development.

To bring order to this growing variety, the European Society of Cataract and Refractive Surgeons (ESCRS) introduced a practical classification that focuses not on lens optics but on what patients actually see. It is based on defocus curve metrics – specifically the usable range of focus (RoF) and the difference in visual acuity (ΔVA) between intermediate and near. Using this system, lenses are placed into Partial Range of Focus (narrow, enhanced, extended) and Full Range of Focus (continuous, smooth, steep). This makes it easier to match an IOL to real-life vision goals, while at the same time reminding surgeons that every class has its own balance of benefits, challenges, and potential side effects.

LENTIS and ACUNEX Quantum IOLs

Enhanced range of field (pRoF) IOLs, which fall between conventional monofocals and EDOF lenses, are designed to provide superior intermediate vision while preserving distance clarity and minimizing optical side effects such as halos and glare. A prime example of this category are the LENTIS and ACUNEX Quantum IOLs, developed by Teleon Surgical. The Quantum lenses feature a patented "Q-zone" progressive aspheric anterior surface, engineered to subtly extend the depth of focus. Bench tests have shown that the lens achieves a modulation transfer function (MTF) value of 0.41 at 50 line pairs per millimeter and a Strehl ratio of approximately 0.6 at a 3.0 mm pupil (Borkenstein et al., 2022). These optical qualities are maintained under conditions of decentration and tilt, confirming the lens's robustness in real-world surgical variability. Specifically, the optical quality remained stable with decentration up to 1.0 mm and tilt up to

5°, demonstrating high tolerance to typical postoperative positioning deviations. The MTF performance remained well above 0.4 even under these stressed conditions, indicating preserved contrast sensitivity. Furthermore, the aspheric anterior surface design effectively minimized spherical aberration across all tested scenarios. These bench results support the lens's suitability for consistent outcomes across a wide range of ocular anatomies and implantation techniques.

Clinical studies further support the efficacy of the Quantum optic design. In a prospective registry involving 102 eyes, patients implanted with the L-333 lens demonstrated significant improvements in uncorrected distance visual acuity (UDVA), with average outcomes improving from logMAR 0.43 preoperatively to 0.06 postoperatively (Borkenstein et al., 2023). More than 80% of patients reported excellent intermediate vision, as verified by Radner reading chart performance. Notably, these results were achieved with a low incidence of photic phenomena, highlighting the optic's balanced profile between function and comfort.

In the extended range of field (extended pRoF) category which is defined by a range of field reaching <1.58 D to < 2.3 D with a VA of > 0.2 logMAR, Teleon Surgical offers the Comfort MF15 optic with a +1.5D near segment on 3 different platforms. LENTIS Comfort, FEMTIS Comfort and ACUNEX Vario. All models are also available as standard toric version, allowing for the correction of corneal astigmatism up to 5.25 diopters. Furthermore, Teleon Surgical offers a +2.0D near addition (MF20) on another 2 platforms. Visiotis Progress and Lentis Comfort MF20. Both platforms are also available as toric versions whereof the Lentis Comfort toric MF 20 can be individualized to 0.1D cylinder for optimal astigmatism correction. The toric EDOF optic design has demonstrated rotational stability and high satisfaction scores in clinical follow-up, making it a robust choice for patients with pre-existing corneal cylinder (Clarion Medical, 2022).

These segment optic refractive IOLs are designed to enhance intermediate and distance vision without employing diffractive optics, thereby avoiding the diffraction trade-offs typically associated with diffractive multifocal IOLs. The Comfort lenses are particularly suitable for patients who prioritize spectacle independence for tasks such as computer work and driving. In studies comparing the LENTIS Comfort lens to other EDOF options, patients reported fewer difficulties with night driving and reduced dependence on spectacles for intermediate activities (Teleon Clinical Data, 2023).

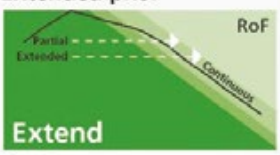
For patients seeking full-range visual correction (fRoF), including near vision, Teleon's LENTIS or FEMTIS Mplus MF30 and the Acunex VarioMax represent a multifocal/varifocal solution. The correct nomenclature for this IOL is a steep transition full range of field IOL

"The Comfort lenses are particularly suitable for patients who prioritize spectacle independence for tasks such as computer work and driving."

defined by a VA >0.2 logMAR of a range of field of >3D and an improvement of VA from intermediate to near of >0.14 logMAR. The Mplus and MplusX MF30 optics are a smooth transition full range of field option with a +3.0D near addition featuring an asymmetric refractive design with distinct segments for distance to near vision. Unlike traditional concentric-ring multifocal designs, the MF30 optic configuration reduces the incidence of halos and glare by avoiding abrupt transitions between focal zones. Studies involving femtosecond laser-assisted capsulotomy implantation have shown excellent centration and minimal tilt, contributing to long-term positional stability and visual outcomes (Holland et al., 2021).

Understanding the patient

To get the best from premium IOLs, the lens design is only one part of the story. The preparation phase must include a deep dive into the patient's lifestyle, daily habits, and acceptance of potential side effects. Those spending long hours at intermediate working distances – such as computer users – are generally better suited to enhanced or extended range

ESCRS Classification	FEMTIS®	LENTIS®	VISIOTIS	ACUNEX®	Optic
Standard	monofocal	monofocal	monofocal	monofocal	aspheric
pRoF	–	Quantum	–	Quantum	Q-Zone
Extended pRoF 	Comfort (toric)	Comfort (toric, patient matched)	Progress (toric)	Vario (toric)	MF15/MF20
fRoF	Mplus (toric)	Mplus/MplusX (toric, patient matched)	–	VarioMax (toric)	MF30
IOL material	hydrophilic	hydrophilic	hydrophilic	hydrophobic	
IOL haptic	Plate haptic	Plate haptic	Closed C-loop	C-loop	

solutions, while patients determined to minimize glasses, even for near, often look toward full range of field IOLs. Surgeons may also combine categories across both eyes or adjust refractions differently to expand binocular performance. Regardless of strategy, transparency about benefits, compromises, and adaptation time is essential.

Enhanced and extended lenses usually allow a gentler transition with fewer light-related issues. Quantum has shown strong results in maintaining contrast with low halo reports, while Comfort MF15/20 also achieves high satisfaction, especially for intermediate clarity and driving. By contrast, full range options such as Mplus MF30 offer the broadest freedom from spectacles, but patients may face a longer period of visual training and a slightly increased chance of photic side effects. Good centration and thorough counseling reduce the risk of dissatisfaction.

Integrating lenses into practice

Integrating these lenses into practice requires more than surgical skills. Core diagnostic steps include optical coherence biometry for precise axial length, corneal topography for astigmatism mapping, and aberrometry to identify higher-order aberrations. These measurements are vital for selecting the correct power and lens type. In addition, modern digital simulators can preview visual outcomes – helping patients to 'see before they see' how contrast, depth of focus, and light phenomena differ across IOL categories. This interactive process strengthens decision-making and helps avoid postoperative surprises.

A further factor, especially with full range optics, is neuroadaptation. As the visual cortex learns to process simultaneous images from different focal zones, perception may evolve considerably during the first 3–6 months. Many patients adapt naturally, but some may benefit from specific visual training or counseling to guide them through this phase. Early support can boost comfort and reduce frustration during the transition.

From a surgical perspective, premium lens implantation benefits from precision technologies such as femtosecond laser-assisted capsulotomy and toric alignment systems. Advanced injector systems, like the Viscojet Bio 2.2 (Medicel)

"With appropriate diagnostics, surgical precision, and patient engagement, premium IOLs can significantly enhance visual outcomes and patient satisfaction."

used with the LENTIS, VISIOTIS an FEMTIS IOLs or the AcuJect 2.0 (Medicel) used with the ACUNEX IOLs, facilitate safe and consistent lens delivery. Postoperatively, follow-up protocols should include early assessment of uncorrected visual acuity, lens centration, and patient-reported outcomes. Minor residual refractive errors may be addressed with glasses or laser touch-up procedures, while significant dissatisfaction should prompt re-evaluation of lens alignment or selection.

One important reminder: the ESCRS system assesses performance mainly in terms of range of focus and acuity but does not reflect side effects or optical phenomena. This underlines the need for thorough staff training. Everyone in the team should understand the properties and potential trade-offs of the different lenses and be able to communicate them to patients. Educational aids such as brochures, demo models, and software tools are valuable here. In the end, a premium IOL program is about creating a full refractive journey, not just supplying a lens.

Conclusion

In conclusion, functional vision classifications proposed by organizations like the ESCRS provide a valuable framework for understanding and implementing IOL technologies. Therefore, Teleon Surgical's IOL portfolio is a good example and fits seamlessly into this classification: the LENTIS and ACUNEX Quantum as enhanced range of field IOLs, the LENTIS and FEMTIS Comfort MF15/20 and the ACUNEX Vario as well as the Visiotis Progress as an extended range of field solution, and the LENTIS and FEMTIS Mplus and MplusX MF30 as well as the Acunex VarioMax as a full range of field offering. Each lens type addresses different patient priorities and clinical scenarios. With appropriate diagnostics, surgical precision, and patient engagement, premium IOLs can significantly enhance visual outcomes and patient satisfaction. Furthermore, surgeons have the option to combine different IOL types for binocular implantation – for example, a monofocal IOL in one eye and an extended pRoF or fRoF IOL in the other. These "mix and match" approaches can enhance the overall range of vision and potentially address specific visual needs of the patient. However, such strategies should only be employed if the surgeon has a thorough understanding of the optical properties and interaction of each lens model. Most importantly, it is essential to have a detailed discussion with the patient beforehand, covering the advantages and limitations in daily life, occupational needs, hobbies, and to jointly define a clear target refraction.

Ultimately, long-term surgical success with premium IOLs depends on the surgeon's deep understanding of the optical principles behind each specific lens design. Only by combining knowledge of optical bench performance with personal clinical experience can ensure optimal outcomes and achieve truly satisfied patients!

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