Presbyopia Treatment Needs Personalisation, Not One-Size-Fits-All

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Presbyopia, the age-related loss of near focusing ability, affects nearly everyone over 40, presenting a significant challenge for ophthalmologists aiming to restore functional vision. While various surgical and optical interventions exist, patient satisfaction remains highly variable, often due to unmet expectations regarding visual quality and freedom from spectacles.

The current landscape of presbyopia correction, particularly with intraocular lenses (IOLs), demands a more nuanced approach than simply implanting the latest technology. Tailoring treatment to individual patient needs and managing expectations before surgery are paramount for improving outcomes.

KEY TAKEAWAYS

- The Pivot: Preoperative simulation tools can predict postoperative vision with enhanced monofocal and extended depth of focus (EDOF) IOLs, allowing for personalised treatment selection.
- The Data: Dissatisfaction rates after EDOF and trifocal IOL implantation range from 1.5% to 15.6%, primarily due to photic phenomena and residual refractive error.
- The Action: Clinicians should use adaptive optics simulators or multifocal contact lenses to demonstrate potential postoperative vision, helping patients make informed decisions and setting realistic expectations.

Presbyopia correction has evolved beyond simple reading glasses, with intraocular lenses (IOLs) offering a surgical solution for many patients seeking spectacle independence. However, the promise of clear vision at all distances often clashes with the reality of visual side effects, leading to significant patient dissatisfaction. Understanding the specific reasons behind these complaints is critical for refining patient selection and improving surgical outcomes.2

Wang and colleagues retrospectively reviewed cases of dissatisfaction following implantation of extended depth-of-focus (EDOF) and trifocal IOLs.2 Their analysis focused on identifying the primary causes of patient complaints, which included photic phenomena, residual refractive error, and neuroadaptation issues. The study, while a retrospective case series, provided valuable insights into the real-world challenges associated with these advanced IOLs.2

Understanding Patient Dissatisfaction and Preoperative Simulation

The primary reasons for dissatisfaction after EDOF and trifocal IOL implantation included photic phenomena (such as glare, halos, and starbursts), residual refractive error, and issues with neuroadaptation.2 Photic phenomena, in particular, represent a significant hurdle for many patients, impacting their quality of life, especially during night driving.3 The incidence of these visual disturbances varies widely in the literature, but they consistently rank among the top reasons for patient complaints.3

Residual refractive error, even small amounts, can severely compromise the intended benefits of presbyopia-correcting IOLs.2 Patients undergoing these procedures often have high expectations for spectacle independence, and any remaining need for glasses, even for specific tasks, can lead to frustration. Neuroadaptation, the brain's ability to adjust to new visual input, also plays a role. Some patients struggle to adapt to the simultaneous vision provided by multifocal or EDOF IOLs, perceiving a reduction in contrast sensitivity or a general blur.2

Shen and colleagues explored the incidence, risk factors, prevention, and management strategies for photic phenomena after presbyopia-correcting IOL implantation.3 Their review highlighted that while these IOLs offer excellent uncorrected vision at various distances, the trade-off often involves some degree of dysphotopsia. Factors such as pupil size, corneal aberrations, and the specific optical design of the IOL contribute to the likelihood and severity of these phenomena.3

The authors emphasized that thorough preoperative counseling is essential.3 Patients must understand the potential for glare and halos, and clinicians should discuss how these might impact daily activities. Identifying patients with specific risk factors, such as large pupils or pre-existing ocular surface disease, can help guide IOL selection.3 For instance, patients who frequently drive at night or have occupations requiring high-contrast vision might be less suitable candidates for certain multifocal designs.

Giacopinelli and colleagues investigated whether multifocal contact lenses (CLs) could serve as preoperative simulators for enhanced monofocal and EDOF IOLs using an adaptive-optics visual simulator, the SimVis Gekko™.1 This approach aims to provide patients with a tangible experience of their potential postoperative vision, allowing them to make more informed decisions and setting realistic expectations.1 The study used adaptive optics technology to precisely replicate the optical properties of different IOLs, then simulated these through multifocal contact lenses.1

The SimVis Gekko™ system allowed researchers to simulate various optical profiles, including those of enhanced monofocal and EDOF IOLs.1 Participants wore multifocal contact lenses designed to mimic these profiles, and their visual performance and subjective satisfaction were assessed. This method offers a dynamic way to demonstrate the trade-offs inherent in presbyopia-correcting IOLs, such as the balance between near vision and distance vision, and the potential for photic phenomena.1

The ability to simulate postoperative vision is a significant advancement.1 It moves beyond abstract discussions of pros and cons, allowing patients to experience, albeit temporarily, what their vision might be like. This direct experience can help manage expectations, reduce anxiety, and ultimately improve patient satisfaction by ensuring a better match between patient needs and IOL characteristics.1 For example, a patient might find that while an EDOF IOL provides good intermediate vision, the slight reduction in distance clarity or the presence of mild halos is unacceptable for their lifestyle. Conversely, another patient might readily accept these trade-offs for greater spectacle independence.

The study by Giacopinelli and colleagues demonstrated the feasibility of using multifocal contact lenses in conjunction with adaptive optics to simulate IOL performance.1 This simulation can help identify patients who might be particularly sensitive to photic phenomena or those who would struggle with the neuroadaptation required for multifocal vision. It also allows clinicians to demonstrate the differences between various IOL options, such as an enhanced monofocal lens versus an EDOF lens, in a personalized manner.1

The open-label design of many IOL studies is an obvious caveat, as patient expectations can heavily influence subjective outcomes.2 But even with objective measures, the variability in patient satisfaction remains high. The retrospective nature

of Wang's case series means it cannot establish causality, but it does highlight common themes in patient complaints.2 The small sample sizes in some of these studies also limit the generalizability of their findings. Still, the consistent reporting of photic phenomena and residual refractive error as key drivers of dissatisfaction across multiple investigations underscores their clinical importance.2,3

The challenge for clinicians lies in balancing the desire for spectacle independence with the potential for visual disturbances.3 Not all patients are suitable candidates for advanced presbyopia-correcting IOLs. A patient with a history of dry eye, for example, might experience exacerbated symptoms with certain IOL designs, leading to greater dissatisfaction. Similarly, individuals with demanding visual tasks, such as pilots or surgeons, may require a more conservative approach to IOL selection.3

The data from these papers collectively point to a critical need for personalized presbyopia treatment.1,2,3 Generic recommendations based solely on age or refractive error are insufficient. Instead, a comprehensive evaluation of a patient's lifestyle, visual demands, personality, and tolerance for visual compromise is necessary. Preoperative simulation tools, like those explored by Giacopinelli and colleagues, offer a practical method to integrate these individual factors into the decision-making process.1

The development of new IOL designs continues, with manufacturers striving to minimize photic phenomena and optimize depth of focus. However, even with technological advancements, the inherent trade-offs in presbyopia correction mean that no single IOL will be perfect for every patient. The emphasis must shift from simply implanting the best available technology to selecting the most appropriate technology for each individual.2,3

The integration of advanced diagnostic tools, such as wavefront aberrometry and pupillometry, can further refine IOL selection.3 These measurements provide objective data on a patient's ocular optics, helping to predict how different IOL designs might perform. Combining these objective measures with subjective simulation experiences creates a powerful framework for personalized care.1

Ultimately, the goal is to achieve a high level of patient satisfaction, which extends beyond mere visual acuity. It encompasses overall visual quality, comfort, and the ability to perform daily tasks without significant visual compromise. The current research highlights that achieving this goal requires a proactive and individualized approach to presbyopia management, leveraging both advanced IOL technology and sophisticated preoperative assessment tools.1,2,3 The next step for the field involves validating these simulation methods in larger, prospective trials to confirm their predictive accuracy and impact on long-term patient satisfaction.

CLINICAL IMPLICATIONS

The era of one-size-fits-all presbyopia correction is over. Clinicians must move beyond simply offering the latest trifocal or EDOF IOL and instead embrace a truly personalized approach, leveraging tools like multifocal contact lens simulation. Failing to do so will only perpetuate the cycle of patient dissatisfaction and post-surgical complaints.

Industry, for its part, needs to support the development and widespread adoption of these preoperative simulation technologies. It is not enough to innovate IOL designs; the focus must also be on improving the patient selection process. A better-informed patient is a happier patient, regardless of the IOL implanted. Patients, often swayed by marketing promises of complete spectacle independence, need to understand

> the inherent compromises of presbyopia-correcting IOLs. It is the clinician's responsibility to set realistic expectations, demonstrating potential visual outcomes and side effects before surgery, not after.
> The data clearly show that photic phenomena and residual refractive error remain significant issues. Until IOL technology eliminates these trade-offs, a thorough, individualized assessment, including simulation, is the only responsible path forward for managing presbyopia.

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