

Dysfunctional Lens Replacement for Near-Plano Presbyopes

Patients' education is a key component for determining the surgical approach.

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In the past decade, there has been a burgeoning interest in the surgical correction of presbyopia. Patients often proactively research surgical options for reducing their dependence on spectacles or contact lenses. Furthermore, a new generation of patients who have undergone prior refractive surgery are now presenting for surgical enhancement options as these individuals develop presbyopia and wish to maintain their spectacle independence. This demand for better options for the surgical management of presbyopia has led to emerging technologies such as corneal inlays, femtosecond laser corneal treatments such as Intracor (Bausch + Lomb/Technolas Perfect Vision), presby-LASIK, and scleral modifications. Not surprisingly, none of these is approved in the United States.

Currently, surgical options in the United States for presbyopic patients include corneal laser refractive surgery using blended vision in the nondominant eye, conductive keratoplasty, and refractive lens exchange with an ever-increasing array of IOL choices. Implant selection will often depend on the patients' optical characteristics, ocular health, needs, and preferences.

DECIDING ON A PROCEDURE

In our experience, a critical factor in the decision making for presbyopic surgery is the characterization of the crystalline lens' status. Advanced "lens-centric" diagnostic technologies such as Scheimpflug imaging (Pentacam Comprehensive Eye Scanner; Oculus) (Figure 1) and double-pass wavefront (Acutarget HD; Acufocus/Visometrics) have led to a better understanding of what we now term

dysfunctional lens syndrome (DLS).¹ This condition describes progressive worsening of presbyopia and the decline in quality of vision due to lenticular opacification and higher-order aberrations associated with the aging of the crystalline lens. In patients with early presbyopia and mild lens opacities (grade 0-1 DLS), corneal refractive surgery options such as LASIK, advanced surface ablation, or corneal inlays are appropriate options. Patients with mild to moderate lenticular changes (grade 2 DLS) are likely to benefit most from lens-based surgery that replaces the natural crystalline lens with a restorative lens implant, that is, a dysfunctional lens replacement (DLR).

DLR simultaneously optimizes a patient's quality of vision through the removal of the lens opacity with its associated aberrations (Figure 2), corrects presbyopia providing relative spectacle independence in most scenarios, and prevents cataract development. A clear benefit

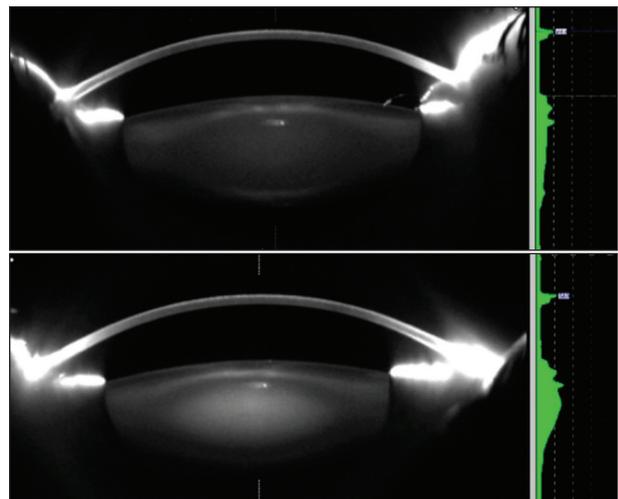


Figure 1. Pentacam image from a patient with a clear lens versus an individual with DLS.

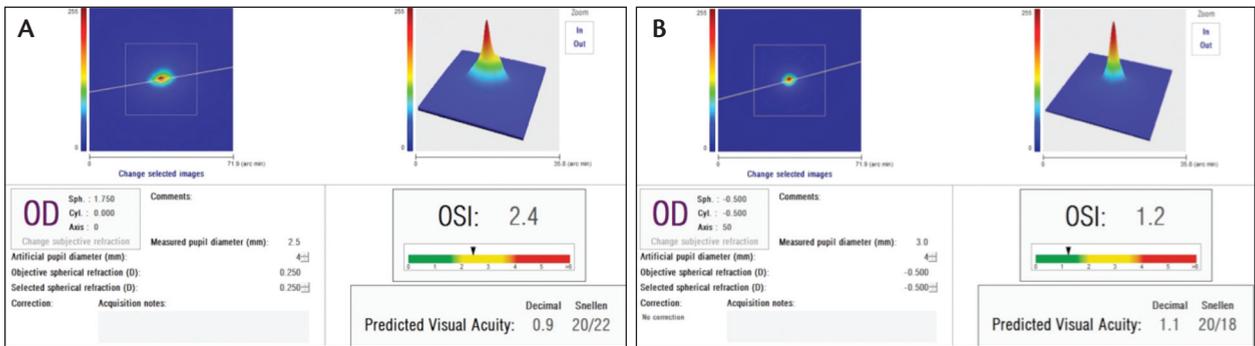


Figure 2. Double-pass wavefront image and ocular scatter index pre- (A) and post-DLR (B) show an improvement in optical quality.

of a lens-based procedure is the avoidance of successive surgeries with the cumulative associated risks of each (eg, corneal-based surgery first followed by further surgery several years later when lens opacities progress). During the refractive consultation, we emphasize to all patients that DLS is a normal part of the aging process and that no action is required. For patients who wish to pursue surgery to treat presbyopia, DLR is presented as an option.

ADDITIONAL BENEFITS

DLR in presbyopic patients may have additional therapeutic benefits in selected cases. It is not uncommon for these patients to have undiagnosed narrow, potentially occludable, angles. For these individuals, removal of the crystalline lens and replacement with an IOL often result in notable widening of the anterior chamber angle (Figures 3 and 4). In cases of recalcitrant ocular hypertension despite patent peripheral iridotomies, removing the crystalline lens can significantly reduce IOP and may even allow patients to discontinue using IOP-lowering medications, which can further improve their quality of life.

Lens-based surgery may also be the preferred option in patients with corneal pathology. In individuals with Fuchs endothelial dystrophy, operating early, before the development of dense nuclear sclerosis, may result in less damage to the corneal endothelium due to a reduction in phaco

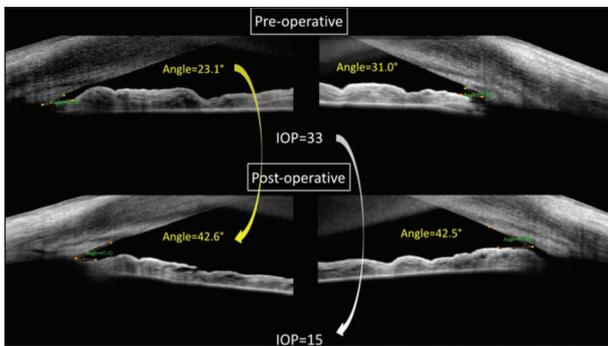


Figure 3. Anterior chamber angle depth before and after DLR in a hyperope with narrow-angle glaucoma using anterior segment optical coherence tomographic imaging (Optovue).

time and power. We have suggested that use of a femtosecond laser characterize DLR and recommend femtosecond laser lens surgery in cases such as this. Additionally, avoiding corneal refractive surgery in patients with significant keratoconjunctivitis sicca, not uncommon in the presbyopic population, is prudent, and again, lens-based options may be preferred.

RISK-BENEFIT RATIO

As with all surgical procedures, we outline the relative risks and benefits of each technique. We are careful to point out that refractive lens surgery is more invasive than LASIK, as the former is an intraocular procedure and thus carries increased surgical risks. Because modern cataract surgery is relatively safe and successful, refractive lens surgery has become a more popular option for managing presbyopia. The risk of endophthalmitis has been significantly lowered with the use of povidone-iodine, intracameral antibiotics, and postoperative antibiotic drops.² Modern phaco technology with advanced fluidics and femtosecond laser technology have resulted in a procedure with established safety and efficacy.^{3,4}

It has been reported that lens surgery is associated with an approximately 1% (0.6%-1.7%) increased risk

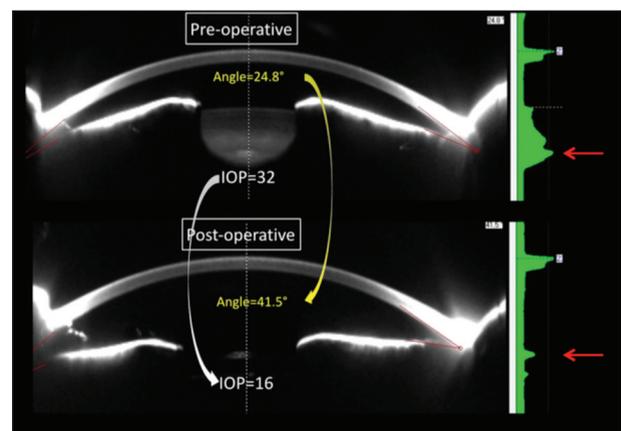


Figure 4. Anterior chamber angle depth before and after DLR in a hyperope with narrow-angle glaucoma using the Pentacam.

of rhegmatogenous retinal detachment.^{5,6} In emmetropic eyes without retinal risk factors such as lattice degeneration, however, the risk is less than in those with high myopia, increased axial length, and lattice degeneration.⁵⁻⁷ Additionally, a significant proportion of emmetropic presbyopic patients have developed a vitreous and posterior vitreous detachment. The risk in this population would conceivably be less than in those undergoing clear lens extraction at a much younger age. Appropriate patient screening and counseling remain very important, and we recommend a retina evaluation preoperatively in patients with retinal pathology or risk factors.

CONCLUSION

The surgical correction of presbyopia is quickly becoming more widespread. Decision making in this area is largely based on patients' candidacy for a corneal or lens-based procedure, and advanced diagnostics have greatly streamlined this process and patients' education. Ultimately, the decision is based on a balance of safety, optics, patients' lifestyle, and cost, and these factors should be clearly communicated to the patient. Femtosecond lasers for lens surgery and advanced IOLs

have allowed us to offer LASIK-like results and avoid the inevitable age-related changes associated with LASIK. ■

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