The Expanding Role of Phakic Intraocular Lenses—Not Just for the Rare Patient Anymore

David R. Hardten, MD

Now—look where phakic intraocular lenses (PIOLs) have come. When I did my first training in PIOLs in 1996 as a preparatory step for one of the clinical trials, I never would have imagined these lenses would be used to prepare the US Military for combat; in children with ametropic amblyopia; or for patients with abnormalities of the cornea such as keratoconus. In the 1990s, PIOLs were for the rare patient with such an extreme amount of correction that the higher risk of an unproven, intraocular technique was chosen over corneal techniques of radial keratotomy, photorefractive keratectomy, or LASIK. This dramatic shift from thinking that refractive corrections could only take place at the corneal surface has resulted in many versatile clinical scenarios where PIOLs are promising, successful, and even the best choice for patients.

This issue of the Journal of Refractive Surgery highlights some of these ever-expanding roles, demonstrating the clinical versatility of PIOLs.

One controversial area is the use of refractive surgical procedures in children. Alió et al1 describe 10 eyes of 10 children with high anisometropia who underwent posterior chamber PIOL implantation (one eye had an iris-supported PIOL). Significant improvement was noted in corrected distance visual acuity (CDVA), with all eyes improving, and all but 1 improving more than 3 lines. Improvement in CDVA is not unusual with PIOLs because the implant is closer to the nodal point of the eye than spectacles. There is also no significant optical degradation as seen with conical refractive surgery at extreme levels of myopic correction. Because PIOLs do not induce irregular corneal astigmatism in the same way as a highly myopic excimer laser correction, significant gains in CDVA are not unique to this study, but have been seen in multiple clinical trials of PIOLs. The children in this study also had subsequent occlusion therapy for amblyopia, likely adding to the improvement in CDVA, although the average patient age was 8 years.

Many issues must still be addressed in children. Because the IOLs are likely to be in place for such a long time, longer-term complication rates and effective management need to be evaluated. Should PIOLs be placed in eyes of these highly anisometropic children sooner to try to minimize the depth of the amblyopia, taking into consideration that the eye is often immature at that stage and still growing with a changing refractive error? What is the ideal age? These cases are relatively rare in the typical refractive surgeon’s office. Currently, refractive surgical correction in children is usually performed in situations where both the refractive and amblyopic management can take place with sufficient expertise.

Keratoconus is a common, challenging, clinical entity encountered in ophthalmic practice. Although great strides have been made in its management with contact lenses and even keratoplasty techniques such as deep anterior lamellar keratoplasty with the femtosecond laser, what can be done for refractive errors without destabilizing the cornea? As exciting as corneal cross-linking (CXL) is for stabilization of the cornea (when the disease is arrested in relatively early stages), such patients often are denied corneal refractive surgery because of their thin corneas or fear of progression of ectasia. Izquierdo et al2 and Sedaghat et al3 present exciting results with PIOLs in keratoconus patients. Their patients had stable keratoconus or had undergone collagen CXL. Although the results may not be as good as in eyes with no irregular astigmatism, they are impressive. Because patients with keratoconus are difficult to manage with contact lenses due to high myopia or high astigmatism, the benefits of PIOLs improve their day-to-day quality of life. One concern of any refractive surgery in keratoconus is the changing refraction due to the progression of corneal ectasia over time. However, with corneal CXL, PIOLs are a great modality to correct the refractive error because these lenses do not destabi-
lize the weak cornea. I believe we will see an increasing use of phakic IOLs in this clinical setting as corneal CXL becomes more prevalent.

To highlight how PIOLs have truly become mainstream, Parkhurst et al.\textsuperscript{4} present results of the posterior chamber Visian Implantable Collamer Lens (ICL; STAAR Surgical Co, Monrovia, California) in myopes in the United States Army Warfighter Refractive Eye Surgery Program. These patients had myopia ranging from $-2.63$ to $-11.50$ diopters (D). This article provides insight into how PIOLs are used currently. In clinical trials, low myopia was rarely treated, and all patients had to have otherwise normal eyes. In this report, the authors demonstrated that even patients with abnormal corneal topography, thin corneas, or dry eyes did remarkably well, with 99% of eyes being within 0.75 D of emmetropia and 96% achieving uncorrected distance visual acuity of 20/20 or better. In military service personnel who cannot wear contact lenses due to the potential for poor access to hygiene and where spectacles are a hindrance to proper fitting of protective gear, refractive surgery adds an important element for survival in combat.

Obviously, no procedure is without complication. Fernandes et al.\textsuperscript{5} present a review of complications that are possible with posterior chamber PIOLs. Careful attention to patient selection, sizing, surgical technique, and adequate iridotomies will decrease the frequency of complications. Complications are not unique to posterior chamber IOLs, and careful attention to technique and selection are also important with anterior chamber PIOLs.

I know you will enjoy the articles in this issue of the Journal. Phakic IOLs are becoming increasingly important in refractive surgery, and are no longer just a niche procedure for the rare patient. They are versatile and unique in their ability to correct refractive errors in those patients who have a clear lens, even in situations where the cornea is not entirely normal. The visual results are excellent, with a good safety profile.

REFERENCES