Advances in refractive surgery continue to accelerate

Cheryl Guttmann
in New Orleans

THE pace of evolution in the field of refractive surgery has quickened in recent years, and will continue to pick up speed, said Richard L Lindstrom MD, in a keynote address of the American Academy of Ophthalmology (AAO) meeting.

"Extraordinary progress will be achieved through a worldwide collaboration between ophthalmologists, basic science researchers, and industry representatives," said Dr Lindstrom, who is founder of Minnesota Eye Consultants, and adjunct professor emeritus, department of ophthalmology, University of Minnesota, Minneapolis.

Dr Lindstrom told attendees that the modern age of refractive correction began in 1949. Several landmark events have shaped current practice occurred during that year, including the introduction of the first aphakic IOL by Harold Ridley MD; the first lamellar corneal refractive procedure for correcting myopia and hyperopia by Jose Barraque MD; and the first fitting of the corneal contact lens by optician Kevin Touhy.

"Today, more than 10 million IOLs are implanted worldwide each year, more than three million corneal refractive procedures are performed, and more than 100 million patients wear a contact lens for refractive error correction," Dr Lindstrom said.

The roots of refractive surgery

However, the roots of incisional refractive surgery reach back more than a century. The origins for astigmatic keratotomy and radial keratotomy (RK) are both found in the late 1880s. In the early 1980s, thanks to the contributions of several noted surgeons, including Dr Lindstrom, the "ARC-T" system evolved into a model for astigmatic keratotomy that is still used effectively to correct relatively large amounts of astigmatism.

Richard L Lindstrom

"I believe that AK and limbal relaxing incisions will remain a useful tool for refractive cataract surgeons, for improving outcomes in phakic IOL implantation, and particularly in regions where excimer laser technology is unavailable," he said.

In contrast, even in its most advanced form, the utility of RK is limited by its association with poor predictability, fluctuating vision, starburst and hyperopic shift, he noted.

"Those complications have reduced global surgeon enthusiasm for RK, and with the exception of settings where laser technology is unaffordable, RK will have no role in the future," Dr Lindstrom said.

In the area of lamellar refractive surgery, LASIK has evolved rapidly in the modern era to become the dominant surgical procedure around the world for treating myopia, hyperopia, and astigmatism. Dr Lindstrom characterised LASIK as "an amazing and elegant operation" and suggested it will remain the preferred refractive procedure for the next 10 to 15 years.

However, he stated that LASIK would probably become an all-laser procedure. Eventually its domination will be eroded by advances in surface ablation and intracocular and intracorneal lens implant technology.

"Currently in the U.S., LASIK accounts for 90% of refractive surgery, whereas in five years, it will still be the market leader, but probably only represent 60% of all procedures," Dr Lindstrom predicted.

Laser-adjustable synthetic keratophakia

Discussing keratophakia procedures, Dr Lindstrom noted that in the modern era, synthetic material (e.g., Intacs) has replaced human tissue for use in keratophakia, and the procedure is showing promise for treating hyperopia, presbyopia, and select cases of corneal ectasia. However, it appears not to be an answer for myopic correction. For the future, Dr Lindstrom foresees the development of laser adjustable synthetic keratophakia as a viable procedure for correcting hyperopia, astigmatism, and presbyopia.

"With the advantage of being reversible, it even has the potential to become the preferred method for treating those problems," Dr Lindstrom said.

Thanks to the contributions of hundreds of clinical investigators and basic scientists, corneal surface ablation became the first major refractive surgery procedure that enjoyed global acceptance. Interestingly, however, just as the first FDA approval for excimer laser PRK was granted in 1995, the procedure was already past its prime.

"PRK came onto the market in the U.S. in 1995, but was dead on arrival because it had already been replaced by LASIK," Dr Lindstrom said.

Currently, surface ablation accounts for about five percent of refractive surgery procedures in the U.S., but Dr Lindstrom predicted it would make a comeback in the form of epi-LASIK and vie effectively with all-laser LASIK.

"Surface ablation is an elegant procedure that yields outstanding results, and arguably, its visual outcomes are also measurably better than those of LASIK," Dr Lindstrom said.

Lenticular approaches may predominate in the future

Discussing IOLs, Dr Lindstrom

"Extraordinary progress will be achieved through a worldwide collaboration between ophthalmologists, basic science researchers, and industry representatives," observed that cataract surgery, which is the most commonly performed ophthalmic surgical procedure in the world, has also evolved to become refractive surgery. Furthermore, thanks to advances in techniques and technology yielding exceptional efficacy and safety results after cataract surgery, interest has grown in refractive lens exchange (RELEX) as a procedure for correcting myopia, hyperopia, astigmatism, and presbyopia in eyes without visually significant cataracts. In fact, RELEX currently ranks as the most rapidly growing refractive procedure in the U.S.

"Cataract surgery with IOL implantation and RELEX will continue to dominate ophthalmic surgery until the development of a modality that can rejuvenate the natural lens. While at one time I thought corneal refractive surgery would replace lens-based surgery as the most common operation performed by ophthalmologists worldwide, I now believe cataract surgery with lens implantation and lens based refractive surgery will be the most common operations," Dr Lindstrom said.

He predicted that there will be changes in lens technology in the future with the introduction of power adjustable, accommodating, photochromic implants that will correct astigmatism and prevent capsular opacification.

Discussing phakic IOLs, Dr Lindstrom noted that the concept was first introduced in 1950, while the modern era began in 1977 with the introduction of the iris-claw IOL by Jan Worst MD. That device is the platform for the first phakic IOL approved in the U.S. - the Verisyse (AMO) IOL. That implant was available earlier internationally as the Artisan (Oqhtec) IOL, and its utilisation along with that of other phakic IOLs to treat moderate to high myopia in pre-presbyopic patients is currently growing worldwide.

"With the development of a multifocal phakic IOL, perhaps this procedure will also be suitable for presbyopes, although it is more likely that RELEX with an adjustable accommodating IOL will become the preferred surgery for presbyopic patients," Dr Lindstrom noted.

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