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Refractive cataract surgery – what we were, what we are, and what we will be: A personal experience and perspective

Cataract surgery has evolved to become a refractive surgery in this modern era. The demand for a better quality of life with the best possible vision is constantly requested by our patients. How to best satisfy this demand thus becomes the utmost priority for eye surgeons. With the help of sophisticated refractive equipment and technologies that encompass newer understandings of ocular anatomy, physiology, and pathology, surgeons are increasingly able to achieve desired refractive outcomes after cataract surgery.

Most eye surgeons can perform safe cataract surgery; however, only 55% of patients achieve emmetropia (± 0.5 D) according to a recent study.^[1] In addition, this study also showed that even a small amount of lower order refractive error can affect the functional and satisfactory visual outcome after cataract surgery. It is now well known that treating or simply reducing even lower orders of astigmatism during cataract extraction leads to better visual outcome and improved patient satisfaction.^[2]

This special issue attempts to gather related articles and reviews to answer the questions of (1) how to accurately correct the greatest possible amount of astigmatism and (2) how best to select and implant a multifocal intraocular lens (IOL) for presbyopia correction to achieve the best possible

uncorrected vision without aberration after cataract surgery.

The evolving history of refractive cataract surgery can be vividly described from my 45 years of personal experience practicing ophthalmology.

As I was fortunately accepted as an intern at the Taipei Railroad Hospital, Taipei, Taiwan when I graduated from Chung Shan Medical College in 1973, I decided to enter ophthalmology residency under the training of Professor Lin Nai-Hwei. There was no refractive cataract surgery at that time. Cataract surgery was done under local block, using intracapsular forceps, and without IOL placement. The wound was 180°, made using a von Graefe's knife, and was closed with only three catgut sutures. The patient's eye was then patched, and the patient had to be hospitalized with strict bed rest for 1 week after surgery. High hyperopic lenses were prescribed for full-time wear to enable patients to see.

During my ophthalmology residency at Cook County Hospital in Chicago, from 1976 to 1980, I performed intracapsular cataract extraction using a cryoprobe under the microscope. Fine sutures were used to ensure good wound closure. After I completed my residency and started my private practice in Honolulu, my first cataract surgery case still was an extracapsular procedure unaccompanied

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by IOL implantation. Phacoemulsification and intraocular lens implantation were learned and practiced by taking courses in the following years. It was not until almost 10 years ago when LASIK and other refractive surgery became popular that I started to practice refractive cataract surgery. My early experience included multifocal IOLs such as array, accommodative IOLs, and limbal relaxing incisions, finally proceeded to femtosecond laser, extended depth of focus IOLs, toric IOLs, and astigmatic keratotomy in recent years.

I have observed a tremendous increase in patients' satisfaction from their postoperative vision improvement and experienced the sense of reward from those successful refractive surgeries.

There is no question in my mind that refractive cataract surgery is here to stay and will continue to progress to ultimately achieve the best refractive vision correction after cataract surgery.

The purpose of this edition is to make available articles describing novel techniques and reviews of various IOLs to assist readers in enhancing their ophthalmic education, to assist them in reaching their future ultimate goal of delivering the best-uncorrected vision after refractive cataract surgery for their patients.

In this edition, three articles will be included:

1. Astigmatic keratotomy to correct residual or mild astigmatism during cataract surgery even after toric IOL using ORA, Verion, and development of a novel nomogram for astigmatic keratotomy during cataract surgery for astigmatism
2. A review of presbyopia-correcting IOLs for the ideal presbyopia correction during cataract surgery
3. A novel quantitated minimal fluid hydrodissection technique in cataract surgery.

From these evidence-based resources, we need to control dry eye disease preoperatively, carefully select qualified patients for refractive surgery, and upgrade refractive equipment to produce an ideal refractive cataract surgical result. However, when faced with a patient who is unhappy with the refractive outcome, we must follow a specific diagnostic and treatment algorithm. We need to evaluate the posterior capsule for opacification that can be managed with YAG capsulotomy. Small residual refractive errors can be corrected with laser vision enhancement. Larger refractive errors can be corrected with a piggyback IOL or even an IOL exchange. The recent development of adjustable lens technologies may represent a future paradigm shift that obviates these hassles.

Adjustable lens technologies can be divided into directly adjustable technologies and modular approaches. The RxSight has recently been approved by the Food and Drug Administration and is a directly light-adjustable lens.^[3] It holds great promise as postoperative refractive adjustments can be performed minimally invasively in the office. Another adjustable lens (RIS, Perfect lens) can be modified after intraocular implantation, wherein the surgeon uses ultrafast femtosecond laser to perform index shaping of IOLs in the office to correct and reverse any refractive errors as desired by patients.^[4,5]

The Gemini refractive capsule (Omega Ophthalmics) is one of the first modular IOLs. It allows IOL exchange for upgrade or downgrade.^[6,7] It also stabilizes the effective lens position and prevents posterior capsule opacification.^[8] Perhaps the most exciting possibility is that with new IOL technology, the patient may be able to check e-mail or use Google Maps through a microchip within the lens.

As I attended the ASCRS, APSCRS, and ESCRS annual meetings recently, I have learned that many of the world's ophthalmologists continue to engage in the research and development of refractive cataract surgery.

I am confident that we will reach our final goal of providing the ultimate best-uncorrected vision after cataract surgery in the near future.

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