“Greatness is not standing above our fellows and ordering them around—it is standing with them and helping them to be all they can be.”
—C. Arthur Keough, Educator

All great innovators need dedicated disciples to disseminate their revolutionary concept. Our field’s most famous innovator, Charles D. Kelman, MD, knew that he needed a few talented, respected surgeons who shared his vision to revolutionize cataract surgery. To find the surgeons with the operative skills to master phacoemulsification, he devised a difficult screening test. The surgeon had to pass a 4-mm cylinder through two round metallic rings 5mm in diameter. These rings were positioned at two different heights and held on a stationary base. Each one had a bell attached that sounded if the ring were touched. The applicant had to pass the metal cylinder through the two rings without causing either bell to ring. The test required extraordinarily steady hand-to-eye coordination. The only surgeon to pass the test for the first several months was Richard Kratz, MD, DSci.

Dick mastered phacoemulsification quickly and began to perform the procedure in 1971. He also taught the new operation to his colleagues, who came from all over the world. He probably instructed more students in the early days of phacoemulsification than anyone else. Subsequently, he used his creative genius to improve and simplify the procedure so that the average cataract surgeon could master it.

On May 23, 2005, Dick was 85 years old, I was 75 years old, and Charlie would have been 75 years old. Dick is still innovating and teaching us.

—Herve M. Byron, MD

For those of you who only know phacoemulsification and IOLs, it is difficult to understand what a crude procedure cataract extraction used to be or the restrictive and disfiguring nature of aphakic spectacles. I performed my first extracapsular cataract extraction (ECCE) in 1945. Since then, the field of cataract surgery has changed profoundly to intracapsular cataract extraction (ICCE) and then phacoemulsification with the implantation of an IOL.

ECCE
In the 1940s, the indication for cataract extraction was a visual acuity of 20/100 or worse in the patient’s better eye. The surgeon washed his hands briefly, then rinsed them with alcohol. Gloves were not used, operating microscopes were unknown, and most ophthalmologists did not use loupes. Assistants held the lighting and directed it at any angle the surgeon requested. Ophthalmologists created the 180° corneal incision just anterior to the supe-
rior limbus with the von Graefe knife. A toothed forceps removed the anterior capsule, and the surgeon squeezed the nucleus from the eye via the pressure of a squint hook dragged across the cornea. There was no cortical cleanup, because cortex could not be seen without magnification and a red reflex. Most surgeons either placed no sutures or maybe one or two 6-0 black silk sutures, which were considered to be very small.

In 1948, I took the basic science course at Moorfields Eye Hospital in London and saw the same technique used by Harold Ridley. Actually, the subsequent fibrosis from not performing cortical cleanup was the only reason that most of his lenses fixed in the anterior chamber. The moment of truth was when the surgeon had removed the crystalline lens without rupturing the capsule or disrupting the vitreous face. Treating vitreous loss involved multiple cellulose sponges and excisions. There were no vitrectors, and without magnification, the vitreous strands could not be well visualized. The development of new capsular forceps, suction cups, and, later, Alpha Chymar trypsin and cryoextractors added to ICCEs popularity. Manufacturers also introduced improved needles and thinner suture materials during this period.

**ICCE**

From the 1950s to the 1980s, ICCE became the dominant cataract extraction technique, primarily because it avoided a return to the OR for 25% of ECCE patients to remove flocculated cortex that filled the anterior chamber. The moment of truth was when the surgeon had removed the crystalline lens without rupturing the capsule or disrupting the vitreous face. Treating vitreous loss involved multiple cellulose sponges and excisions. There were no vitrectors, and without magnification, the vitreous strands could not be well visualized. The development of new capsular forceps, suction cups, and, later, Alpha Chymar trypsin and cryoextractors added to ICCEs popularity. Manufacturers also introduced improved needles and thinner suture materials during this period.

**PHACOEMULSIFICATION**

In 1971, I took the first phaco course offered by Charles Kelman, MD. Attendance was limited to six students, and the class was held once a month. By September 1972, Robert Sinskey, MD, and I were teaching phacoemulsification to 25 ophthalmologists each month. We simplified the procedure by moving the emulsifica
tion from the anterior chamber to the iris plane in order to protect the cornea. We modified the machine and added hydrodissection, two-handed surgery, and the scleral tunnel incision.

Many ophthalmologists were opposed to phacoemulsification. They said that the learning curve was too great and the complications too many. In 1973, some prominent ophthalmologists found that they were losing their cataract patients to surgeons who practiced the newer technique. They convinced Medicare to declare phacoemulsification experimental and not payable. Continuing to perform phacoemulsification exposed the surgeon to malpractice and a loss of license. This situation lasted until 1974, when an AAO committee found that ICCE and phacoemulsification had an equal number of complications. Medicare then reinstated its approval and payment.

**IOLs**

**Design**

In the 1970s, IOLs were angle or iris supported. The rigid angle-supported IOLs were either too large and painful or so small that they rotated in the anterior chamber. Some lenses abraded the iris stroma and caused UGH syndrome. ACIOLs with compressible loops often caused angle-closure glaucoma. Iris-supported IOLs resulted in irregular pupils, and they often subluxated into the anterior or posterior chamber.

In 1977, Steven Shearing, MD, showed his capsular-bag-fixated J-loop IOL to me when he had implanted it in only four eyes. It was the first IOL design since those of Harold Ridley and John Pearce to be completely in the posterior chamber. The IOL immediately became my lens of choice, and I invited Dr. Shearing to join the Sinskey/Kratz phaco/IOL course. William Simcoe, MD, also introduced a PCiol with C loops. Thomas Mazzocco, MD, taught at our phaco/IOL course and invented the first foldable IOL in 1982. Today, most of the IOLs used in the world are based on Drs. Shearing’s, Simcoe’s, and Mazzocco’s inventions.

**California**

Because the early IOLs had a relatively high complication rate, many ophthalmologists strongly opposed their use. Gradually, the successes of Norman Jaffe, MD; Henry Clayman, MD; Henry Hirschman, MD; Miles Galin, MD; Dennis Shepherd, MD; Ralph Anderson, MD; and Herve Byron, MD, gained recognition, and more ophthalmologists and their patients began to prefer IOLs to aphakic spectacles.

In 1975, the California State FDA (with the cooperation of the US FDA) declared that IOLs were drugs rather than devices and were thus under the FDA’s jurisdiction. My colleagues and I were shocked when the California State FDA suddenly declared IOLs experimental and banned them from use in California but not in the other 49 states. Two-thirds of the world’s supply of IOLs were made in California, and the companies were prohibited from manufacturing them.

The companies obtained a legal opinion that a lens implant had to be manufactured, packaged, and sterilized before it could be called an IOL. They continued making the lenses and sent them to nearby Las Vegas for sterilization and shipment. Dr. Hirschman, Mary Kay
Michaelis, M D, and the American Implant Society obtained a restraining order that allowed California ophthalmologists to resume using IOLs.

**FDA Hearing**

In 1980, the US FDA held a hearing in Washington, DC, in an effort to ban IOLs. The most vocal opponent of the IOL was Sidney Wolfe, M D, of Ralph Nader’s Health Research Group. He misleadingly stated that the complication rate was 50% and requested that IOLs be outlawed. He achieved this statistic by including even the most minor adverse reactions in his total and then dividing by the number of patients instead of merely stating the number of patients who had one or more problems.

Testifying on behalf of IOLs were a doctor and a pilot, both of whom had received lens implants. They stated that they would not have been able to continue their work if they had had to depend on aphakic glasses. Actor Robert Young, who played the part of Dr. Marcus Welby on a popular television series, was the third and most effective speaker. He stated that he had nearly been blind from cataracts when I implanted his IOLs in 1976. When he left the hearing, he was greeted by reporters from all of the major TV channels. One reporter asked, “Dr. Welby, what do you think of IOLs?” He replied, “First of all I am not a doctor. I am an actor who plays the part of Dr. Welby.” At that point, he grabbed the reporter by the tie and said, “But let me tell you that implants saved my career and should be available to all Americans.” That statement was on all of the news channels, and even the FDA could not go against the advice of America’s favorite doctor.

**CONCLUSION**

Sir Harold Ridley proved that the eye could tolerate an artificial lens. Dr. Kelman demonstrated how to remove the nucleus and cortex through a small incision. Drs. Shearing and Simcoe showed where to place the lens. Dr. Mazzocco proved that the IOL could be folded and inserted through a small incision. Now, we surgeons should turn our attention to preventing cataracts.

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