

From von Graefe to Kelman

A timeline of ophthalmic advances in the 20th century.

BY RICHARD KRATZ, MD, DScI

My first introduction to extracapsular cataract extraction (ECCE) was in 1946. The procedure's surgical indication was visual deterioration to 20/200 in the patient's better eye. At that time, we only operated on nearly mature cataracts, because immature cataracts could not be expressed (and were "left to ripen"). We had no microscopes, red reflex, loupes, or gloves, and we often had no sutures or only one suture. We commonly used topical anesthesia during cases.

We created 180° clear corneal incisions (equaling 16-mm incisions) with a von Graefe knife. We created the capsulotomy using a toothed forceps called a *tenaculum*, which we inserted into a flat anterior chamber. Ophthalmologists had no idea of the endothelium's delicate nature. We performed nucleus expression by dragging squint hook pressure across the patient's cornea. Because we could not see the cortex in the absence of a red reflex, we did not conduct cortical cleanup.

The average hospital stay lasted 2 weeks and involved positioning sand bags at the patient's head and 10 days of absolute bed rest. A cataract patient's eye pads remained in place until the fifth postoperative day, and we uncovered the unoperated eye on the sixth. Patients received their first pair of postoperative spectacles at 3 months, although we altered their prescriptions frequently due to their changing amounts of astigmatism. Twenty-five percent of ECCE patients returned to the OR to have the cortex washed from their anterior chambers, and the house staff became experienced with flat chambers and iris prolapses.

GRADUAL ADVANCES

Surgeons seldom used sutures, because it was difficult to pierce the corneal and scleral tissue with the tapered needles that were available. When reverse-cutting needles were introduced in the 1930s, surgeons gradually transitioned from ECCE to intracapsular cataract extraction (ICCE). Ophthalmologists hailed the advent of ICCE as an advance, because the procedure did not require patients to return to the OR for cortical removal. Also, improvements in capsular forceps enabled surgeons to extract the entire crystalline lens. The enzyme alpha-chymotrypsin was used to weaken the zonules. A suction device called an *erysiphake* was developed, as was the cryoprobe, thanks in large part to Charles Kelman, MD. The use of one, two, and four sutures became commonplace as manufacturers developed better needles and smaller suture materials. Loupes also gained popularity, but microscopes were rare until after the development of phacoemulsification.

PHACOEMULSIFICATION: MY INTRODUCTION

At the 1969 AAO Meeting in Chicago, Nicholas Douvas, MD, gave a presentation on cataract extraction using the Roto X (T. H. Kemp Co.), a device that later became an excellent vitrector. At the same meeting, I delivered a presentation on aspirating soft cataracts with a needle through a peripheral iridectomy instead of the pupil. In addition, Charlie shared the results of his first few cases of phacoemulsification. I was so impressed with his presentation that I asked to take his course as soon as it was available. Enrollment entailed paying \$40,000 for

the machine and \$1,000 for the course—an outrageous sum for those days. I took the course.

In October 1971, I began performing phacoemulsification. Robert Sinskey, MD, who took Charlie's course in early 1972, asked me in the fall of that year to join him in establishing phaco courses in Santa Monica and Van Nuys, California. We lectured, demonstrated live surgery, and then oversaw class participants' performance of live surgery on cats. Dr. Sinskey and I offered our course for many years and taught a large number of surgeons. Some of the other instructors with whom we worked included James Little, MD; Thomas Mazzocco, MD; and Steven Shearing, MD. The Sinskey/Kratz course did a lot to popularize phacoemulsification.

TECHNIQUE AND NOMENCLATURE

Charlie preferred the term *KPE (Kelman Phaco Emulsification)*. He taught a one-handed technique of subluxing the nucleus into the anterior chamber for emulsification. My concern about injury to the corneal endothelium prompted me to develop a two-handed technique that carried out the emulsification in the iris plane. When I presented my technique at a meeting, Charlie became upset and told the audience that my procedure was not a KPE. I replied that we would not even have to change the initials. Since then, other ophthalmologists have developed variations on the original technique.

WEATHERING THE BACKLASH

Outward hostility toward phacoemulsification became evident in 1973, when prominent ophthalmologists began losing cataract surgery cases to phaco surgeons. These well-known practitioners attempted to destroy phaco by making outrageous statements such as, "Phaco is OK after you learn it, but the first 50 eyes are blinded during the learning curve," and "Phaco causes glaucoma." Charlie did not help matters when he stated, "Anyone over age 30 is too old to learn phaco." He further shocked people by discharging his hospitalized patients on the same day or the day after surgery and permitting them to return to full activity on the first postoperative day, whereas most cataract surgeons kept their patients in the hospital for 6 days after surgery. Furthermore, whereas traditional ophthalmologists shunned publicity, many newspapers and magazines published articles about the wonderful advancement of phacoemulsification. In an effort to resolve the dispute over ICCE versus phacoemulsification, the AAO appointed a committee chaired by Richard Troutman, MD, in early 1974 to evaluate the safety of the new procedure.

At one point, prominent ophthalmologists convinced Medicare to declare phacoemulsification experimental and therefore not reimbursable, an act that exposed

phaco surgeons to malpractice suits and the loss of their licenses. At the AAO annual meeting in October 1974, 12 phaco surgeons, including myself, met with Charlie for a "midnight breakfast" to discuss the procedure's reinstatement by Medicare. We were relieved when, a few days later, Dr. Troutman presented a preliminary report of the AAO-appointed committee's statistical analysis involving 5,780 eyes. The patients had been divided into the study groups of ICCE, phacoemulsification, and nonphacoemulsification ECCE. The study subjects were age-matched, and the investigators had evaluated the eyes for visual acuity and the rate of complications. Dr. Troutman reported that the results for all groups were statistically equal.^{1,2} Approximately 2 months later, the FDA lifted its ban.

RIPPLES OF CHANGE

After removing the nucleus and cortex through a 3-mm incision, it seemed a shame to enlarge that incision to 7 mm in order to insert an IOL. In 1983, Dr. Mazzocco developed a foldable IOL that allowed surgeons to take full advantage of phacoemulsification's small incision size. This technological advancement realized Charlie's dream of a foldable IOL inserted through a 3-mm incision. Surgeons' use of phacoemulsification greatly increased after foldable IOLs became available, and, today, most IOLs are foldable.

Charlie changed all of our lives. He improved the lives of millions of patients and indirectly prompted advancements in all of the surgical specialties. He is responsible for:

- reducing the incision size from large to small;
- replacing hospital stays with outpatient surgeries;
- introducing the practice of allowing patients to resume full physical activity immediately after surgery;
- popularizing the use of the microscope;
- developing and teaching non-university courses for which he charged a fee; and
- welcoming publicity for the medical profession.

On the night of our midnight breakfast meeting back in 1974, when the 13 of us were trying to decide on a course of action, Charlie was upbeat. He said, "Tonight we are meeting with the AAO. Soon they will be meeting with the phaco surgeons." On November 17, 2003, at its 107th Annual Meeting, the AAO held a special evening symposium to bestow the honor upon Charles David Kelman, MD, that he so richly deserves. ■

Richard Kratz, MD, DSci, is retired and resides in Fullerton, California. Dr. Kratz may be reached at (714) 256-5984; rpkratz@att.net.

1. Troutman RC. Preliminary report of the committee on phacoemulsification. *Trans Am Acad Ophthalmol Otolaryngol.* 1974;78:OP-178-41-OP-42.

2. Troutman RC. Cataract survey of the cataract-phacoemulsification committee. *Trans Am Acad Ophthalmol Otolaryngol.* 1975;78:OP-178-OP-185.