Having been around ophthalmology for a long time, I have witnessed nearly the entire gamut of IOL designs used in the United States from the 1960s to today. During my residency training—from 1969 through 1973—my mentor, Miles A. Galin, MD, and others initially implanted Maltese Cross IOLs (Copeland) with an intracapsular cataract extraction (ICCE) technique. Thereafter, they converted to the Sputnik IOLs designed by Russian ophthalmologist Svyatoslav N. Fyodorov, MD. During my training, Dr. Fyodorov befriended my chief and visited our hospital; indeed, I assisted him at surgery. Some faculty members also implanted Binkhorst four-loop IOLs (Morcher GmbH) after ICCE (Figure 1); however, residents were not permitted to implant IOLs at that time.

Entering Practice

After 2 years of duty with the US Navy, where lens implants were not used, I entered practice in 1975 and first implanted IOLs in 1976. I used two-loop Binkhorst IOLs (Morcher GmbH) that were designed for iridocapsular fixation after extracapsular cataract extraction (ECCE) in my first few cases (Figure 2). However, given the rudimentary surgical methods for ECCE at that time and the less-than-ideal fixation of the two-loop IOL design, in 1977, I reverted to ICCE by cryoextraction and implanted four-loop Binkhorst and Worst Medallion IOLs (Medical Workshop; Figure 3). Both implants required 11.5-mm incisions and a soft eye; the latter was achieved routinely with retrobulbar block, lid akinesia, ocular massage (eventually with the Honan Balloon), intravenous mannitol, and—fortunately very rarely—pars plana vitreous aspiration with a 22-gauge hypodermic needle.

Both the Binkhorst and Worst lenses were served best by some form of suture fixation. With the four-loop Binkhorst lens, either the superior anterior loop was sewn to the superior iris or the two superior loops were sewn together through the superior peripheral iridectomy. The Medallion IOL had two fixation holes through which a suture could be placed and secured to the iris. Initially, 10-0 nylon was employed; however, in time it became evident that the nylon was subject to hydrolysis, and then 10-0 polypropylene became the suture material of choice.

Until suture fixation became routine, the four-loop Binkhorst and Worst Medallion IOLs were associated with a relatively high risk for dislocation. Additionally, given that the IOLs were 3-D in their cross-section, they required large incisions for implantation. It is hard to imagine that IOLs of their dimensions could be implanted without aid of an ophthalmic viscosurgical device (OVD), but those materials did not become available until the early 1980s. Implant surgery in their absence was attempted under air, and this was always tenuous. In my view, OVDs represent the single most important development in IOL surgery. By expanding space and time, OVDs allow surgeons of all skill levels to achieve nearly uniform success.

Figure 1. A four-loop Binkhorst IOL placed at the time of ICCE. The IOL is fixated in the pupillary space with parallel loops anterior and posterior to the iris.

Reminiscing About Personal IOL History

Today, many once-common IOL-related complications have all but disappeared.

By Samuel Masket, MD
In this early stage of my career, I avoided primary implantation of anterior chamber IOLs.

**THE ADVENT OF PHACOEMULSIFICATION**

The advent of single-plane posterior chamber IOLs, automated devices for ECCE, and improved phacoemulsification units served to change my practice radically. In 1979, I began to use Shearing and Sinskey three-piece IOLs (both Iolab) with planned ECCE. After observing Richard Kratz, MD, and others performing phacoemulsification, I converted to this technique in 1980. I also evaluated a variety of posterior chamber IOLs, eventually preferring the Precision Cosmet Kratz three-piece PMMA optic with modified polypropylene C-loops (Precision Cosmet Co.).

During this era, long-term clarity of the posterior capsule was a concern; with ECCE, I routinely opened the capsule at the close of surgery with a disposable 25-gauge hypodermic needle. The needle was bent and then passed through the superior incision and under the IOL to reach the posterior capsule via a peripheral iridectomy. Fortunately, the Nd:YAG laser became widely available in the early 1980s, revolutionizing cataract surgery by allowing surgeons to leave the posterior capsule undisturbed until it became opaque. The majority of IOLs that I implanted in this period were furnished with a Hoffer barrier, a ridge that separated the posterior capsule from the back surface of the IOL, thus reducing laser pitting of the optic.

All the innovations mentioned above added to the widespread acceptance of phacoemulsification and posterior chamber IOLs. However, modest IOL decentration was commonplace, owing to difficulty of placing the haptic loops symmetrically in the capsular bag after can-opener anterior capsulotomy (Figure 4). As one strategy to prevent decentration, some surgeons placed the haptic loops in the ciliary sulcus; however, in a small number of cases the polypropylene loops induced posterior iris chafing with the potential for uveitis-glaucoma-hyphema syndrome. In the mid-1980s, when one-piece rigid PMMA posterior chamber IOLs came to the marketplace, I converted to their use, as they were less likely to induce posterior iris chafing.

Around this time, I designed a one-piece gull-wing IOL intended to improve centration and reduce point-contact iris damage. Although it performed well in trials, the lens failed to become a production model, as another company absorbed the manufacturer.

**FOCUS ON ASTIGMATISM, INCISIONS, AND SUTURE CLOSURE**

Over the next several years, my IOL preferences and cataract surgery methods remained relatively similar, but
I focused heavily on studies of surgically induced astigmatism and methods of suturing and incision closure. In 1982, I added a superiorly oriented 6.5-mm sclerocorneal tunnel (ie, scleral pocket) to my routine and experimented with suture materials, sizes, and patterns (Figure 5). I regularly employed an intraoperative quantitative Terry keratometer with tonometry. In 1986, I reported the use of temporally oriented sclerocorneal tunnel incisions for secondary IOL implantation, but I failed to consider using the temporal location routinely.

In the late 1980s, sutureless incision methods, reduced-dimension and foldable IOLs, and continuous anterior capsulotomy (ie, capsulorrhexis) were developed, and I changed my surgical strategy to embrace these advances. In particular, the capsulorrhexis greatly reduced or eliminated IOL decentration and iris chafing.

Following the lead of I. Howard Fine, MD, by 1993, I had changed my incisions from superior sclerocorneal tunnels to temporal clear corneal incisions. I implanted all varieties of foldable IOLs, lens materials, and optic designs. Initially, reduced-dimension oval IOLs gained popularity, but, as I came to learn and subsequently publish, they were associated with undesired optical imagery, later referred to as dysphotopsia. I participated in clinical trials of multifocal IOLs as early as 1990 and have used a variety of them over time.

I have always preferred to work with the smallest possible incisions. As a result, over the past decade, I have mainly implanted IOLs from the AcrySof (Alcon) one-piece platform. The AcrySof was the first lens available that could be implanted via a 2.2-mm incision, and I became enamored of the refractive and physical stability of the reduced incision size. I reported statistically less surgically induced astigmatism with 2.2-mm incisions than with 3.0-mm temporal incisions. The AcrySof platform now includes toric and multifocal IOL models, which I use as appropriate. In time, several other lens makers developed IOLs that fit through incisions of that size range, and I have used a variety of these.

**VISUAL SIDE EFFECTS**

As many advances have been brought to our field and increasing numbers of patients have had cataract surgery, serious IOL-related complications have all but disappeared. At the same time, patient expectations regarding the optical results of surgery have been elevated significantly, and some annoying, if not sight-threatening, side effects of IOLs have been recognized. Among the most common are undesired optical phenomena, or dysphotopsia. Together, positive dysphotopsia (PD) and negative dysphotopsia (ND) account for the greatest likelihood for patient dissatisfaction following otherwise uncomplicated surgery. PD is generally reported as...
halos, rings, and light streaks, whereas ND is described as a temporal dark shadow, much like horse blinders. The incidence of PD has declined with improved IOL edge and optic design, but ND is more enigmatic and has remained troublesome to a small number of patients.

Given my prior investigation, I have designed an IOL to prevent ND. In Germany, H. Burkhard Dick, MD, PhD, has implanted the Masket Anti-Dysphotopic IOL (Morcher GmbH; Figure 6) in a small number of patients (Figure 7). This IOL features a peripheral groove that captures the optic in the anterior capsulorrhexis. As the optic overlies the capsulotomy, ND is eliminated and excellent centration of the IOL is obtained. Given preliminary success with the design, I anticipate its distribution in Europe in the near future. I hope ultimately to have the opportunity to implant the lens in the United States.

**CONCLUSION**

Nothing is more illustrative of the changes that we have experienced in cataract surgery than recounting the history of IOL technology and phacoemulsification. I have posted several of my old teaching videos on Eyetube, showcasing surgeries from years ago.

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