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NEWS & OPINION

Insights Boldly going where no man has gone

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Innovation and entrepreneurship are ushering in a new Golden Age of anterior segment surgery

Game-changer (n): a newly introduced element or factor that changes an existing situation or activity in a significant way.

Physicians can be divided into two subsets. One group speaks

morosely of a past that wasn't as golden as they would imagine. The other can't wait to see what wonderment lurks just below the horizon.

Genetically driven personalized medicine, gene deletion and replacement, robotics and nanotechnology, stem cell therapy, and the paradigm shifting power of artificial intelligence are inaugurating an extraordinary moment in medicine.

Innovation has commandeered podia at ophthalmic symposia worldwide. This year's ASCRS•ASOA Symposium & Congress was exceptional for the number and novelty of evolving technologies and techniques that hold revolutionary potential.

What did you learn at the 2017 ASCRS•ASOA Symposium & Congress that changed your practice or surgery? Share your thoughts on the EyeWorld blog, blog.eyeworld.org.

MIGS

Microinvasive glaucoma surgery (MIGS) is not a brand new thing anymore. Cataract surgeons have adopted its latest iterations as an alternative to trabeculectomy, the erstwhile standard of glaucoma specialists. A tool for mitigating challenges of non-compliance, drug prices, and surgical complications, its variants exploit new insight into the eye's drainage system.

Concluding the Innovator's Lecture, Reay Brown, MD, teased the audience with his concept of a shunt functioning as a pump rather than passive conduit. Magnetic fields help propel aqueous through the shunt. Until the codes of neuroprotection and regeneration are cracked, such improvisations will appease the only variable affecting glaucoma's otherwise ineluctable progression.

Zepto capsulotomy

The femtosecond laser can create a near perfect rhexis. But its formidable price and inconvenience have limited its overall acceptance. To avoid unpleasanties with the OIG, recouping cost of investment requires bundling use with non-covered appliances such as toric intraocular lenses and procedures, e.g., laser relaxing incisions. The Zepto system (Mynosys, Fremont, California) provides an alternative to create perfect capsulorhexes and, having received FDA approval, is coming soon to a surgical theater near you.

The unit uses nano-electrical pulsations and a nitinol cutting element. Nitinol is a nickel and titanium alloy that features unique properties of shape memory and pseudoelasticity. Its ancestor was discovered in 1963; modern nitinol has found application in vascular stents and urologic baskets.

The system consists of a compact console; the rhexis is accomplished by a disposable handpiece that microscopically stretches and incises the anterior capsule and suctions the

remnant. Because of its elasticity, it requires a corneal incision no larger than 2.2 millimeters. John Hendrick, president and CEO of Mynosys, reports that the console will cost \$10,000. Replicating the femtosecond laser's precision, it complements a new generation of IOL whose optic has a circumferential groove affording support and centration by the anterior capsular ring and adds a margin of safety to complex and challenging cases.

Never-ending battle against presbyopia

Expropriating a French optician's skill in the 1760s, Benjamin Franklin is credited with the invention of bifocal spectacles. Increasing literacy and life expectancy beyond presbyopia's onset might explain this convenience's actualization in the 18th century.

Today, ophthalmologists offer several options to nullify bifocals' duress. None have proven totally satisfactory. Intraocular lenses with more than one focal point have been around for 30 years. Percival et al. reported on 111 eyes with multifocal implants from three manufacturers (3M, IOLAB, and AMO) in 1991.¹ Although now better understood, many of the problems alluded to—reduced resolution efficiency and glare, blur, and ghosting—continue to plague modern renditions. Robert Weinstock, MD, and Bill Wiley, MD, presented data on two competing offerings that may provide remedy: the Raindrop Near Vision Inlay (ReVision Optics, Lake Forest, California) and the KAMRA Inlay (AcuFocus, Irvine, California). The former is a hydrogel disk with no refractive power, its myopic effect created by steepening the central cornea's surface. The latter, a polyvinylidene ring with central aperture, produces a small amount of minus power. They lodge in corneal pockets created by the femtosecond laser. Both are reported stable over time and, unlike other presbyopic procedures, are reversible. Both are FDA approved, although

KAMRA's regulatory path was contentious.²

Richard Lindstrom, MD, tantalized his audience with reports of an eye drop called EV06 (Novartis, Basel, Switzerland) that changes the molecular structure of lenticular protein to restore elasticity. It penetrates the cornea as a pro-drug breaking down into lipoic acid and choline esters whose active form targets disulfide bonds within the lens. According to Dr. Lindstrom, increased accommodative function can persist for months.

Refractive index shaping

Although evolution of the intraocular lens has been linear, anomalies like the Shearing posterior chamber lens, the Mazzocco taco, and today's multifocal, toric, and extended depth of focus lenses propel its evolution.

An exciting application of femtosecond laser technology (Perfect Lens, Irvine, California) may provide eye surgeons a method to go back to the future by implanting classic hydrophobic IOLs and then customizing the acrylic material in the office to fit the patient's needs and expectations in as little as 20 seconds. This advance may also grant the unhappy patient and distressed ophthalmologist a do-over in the case of refractive surprises and aberrational symptoms.

Presentations by Randy Olson, MD, and David Schanzlin, MD, introduced these prospects. By applying femtosecond laser energy, the refractive index of acrylic IOLs can be changed to increase or decrease spherical power, induce or reduce implant toricity, and add or subtract multifocal effect after surgery. The femto's infrared wavelength restructures chemical bonds to change refractive index of as little as 50 microns of the implant. Hypothetically, an implant may be modified as a patient's function changes with age and inclination.

Richard Feynman famously said, "Innovation is a very difficult thing in the real world." But he graciously presented a

roadmap. He advised being bold, curious, brutally honest, and to always aim for simplicity. I might add access to venture capital helps, too. Golden ages come and go but this one might be special.

References

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2. FDA Panel Delivers Mixed Verdict on KAMRA Corneal Inlay. *Medscape*. June 9, 2014.

Editors' note: Dr. Noreika has practiced ophthalmology since 1981. He has been a member of ASCRS for more than 35 years.

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