Beyond the Phaco Machine

Revolutionary innovations in OVDs and evolutionary innovations in IOL injectors.

BY UDAY DEVGAN, MD, FRCS(GLASG)

It has been said that the only constant is change, and that adage certainly applies to cataract surgery. The phaco procedure that we ophthalmologists perform today is very different from that of just a decade or 2 ago, and I anticipate further changes. These developments typically involve a product's evolving to become better, easier to use, safer for the patients, and (one hopes) less expensive. Sometimes, however, a revolutionary innovation rapidly and permanently changes the way in which we perform surgery.

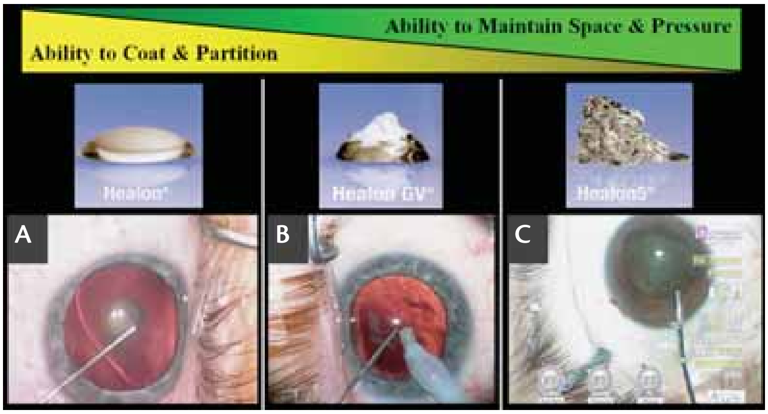

Figure 1. The Healon family of viscoelastics allows the surgeon to choose the product that best fits the required need. In routine cases, the versatility of Healon gives corneal endothelial protection (A). Healon GV has a greater viscosity and maintains space and pressure, such as in this highly myopic eye to prevent collapse of the anterior chamber (B). Healon5 is used to prevent iris prolapse in a case of floppy iris syndrome (C).

REVOLUTIONARY: PROTECTION OF OCULAR TISSUES DURING SURGERY

When Healon (sodium hyaluronate; Abbott Medical Optics Inc. [AMO], Santa Ana, CA) was first introduced more than 20 years ago, it was a revolutionary idea: an injectable, ophthalmic viscosurgical device (OVD) to protect ocular tissues and make cataract surgery safer and easier. Prior to Healon's availability, the standard in surgery was to use air to maintain space in the eye. This technique was less than ideal, because the air had a tendency to leak and obscure visualization, and it provided minimal protection to the corneal endothelium. Healon maintains stability in the eye, provides excellent visualization, protects the corneal endothelium, and facilitates the IOL's implantation. Patients had better visual results in a safer, more controlled surgery. As we surgeons learned to use OVDs, it became clear that two main attributes give us the versatility: the OVDs' ability to coat and protect and its ability to maintain space and pressure (Figure 1).

OVDs are helpful at the beginning of surgery to maintain the anterior chamber, flatten the anterior lens capsule, and enhance control during the creation of the capsulorhexis. During phacoemulsification, the OVD protects the corneal endothelium and other delicate ocular tissues. At the end of surgery, OVDs allow for expansion of the capsular bag to facilitate the lens' implantation. Phaco surgery without OVDs is more difficult for the surgeon and far riskier for the patient.

Having a spectrum of viscoelastics available for surgery allows the ophthalmologist to tailor his or her use of the OVD. Healon has the ability to coat and protect the corneal endothelium from the fluid currents and ultrasonic energy during phaco surgery. Minimizing surgical trauma gives our patients clearer corneas, better vision, and a quicker recovery after the cataract procedure.

In a case where the anterior chamber is relatively flat, performing a capsulorhexis is difficult due to poor maneuverability and a lack of flattening of the anterior lens capsule. We can address the problem by injecting a high-viscosity OVD like Healon GV (GV stands for greater viscosity; AMO.). Healon GV tends to act more like a solid, maintaining space and pressure better than a more dispersive and liquid OVD. Healon5 (AMO) offers even greater tissue manipulation and control in cases with small pupils or floppy iris syndrome.

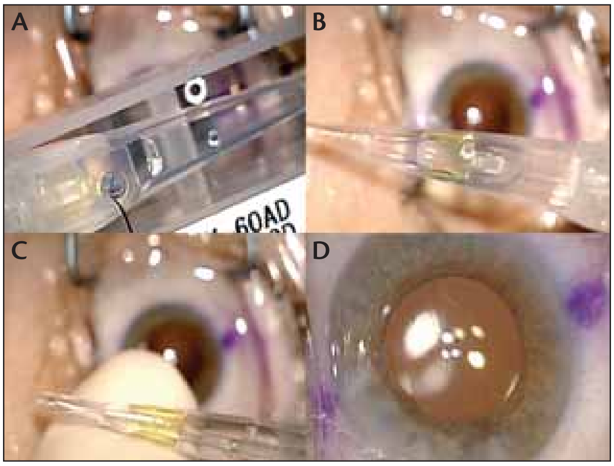

Figure 2. Viscoelastic is injected into the port of the injector (A), and the plunger is advanced. This engages the optic (B) and then proceeds to symmetrically fold the lens (C), allowing for placement in the capsular bag with excellent centration (D).

EVOLUTIONARY: HIGH-QUALITY, PRELOADED IOLs EMERGE

Strategies for the IOL's Insertion

Methods for inserting the IOL have evolved at a steady pace during the past 50 years. The first generations of IOLs were designed for intracapsular surgery and were placed in the anterior chamber or fixated to the iris. With the switch to extracapsular surgery, PCIOLs made of PMMA could be implanted in the capsular bag or ciliary sulcus through 6- to 8-mm incisions.

In the 1990s, we learned to use foldable IOLs made of flexible materials such as silicone and acrylic. The implantation of these lenses required a lens-folding forceps and a lens-holding forceps. We used the folding forceps to bend the lens in half like a taco, and then we would grasp it with the holding forceps and manually insert it through the incision into the eye. This allowed for incisions of approximately 3.5 to 4.0 mm in width, although there was a risk of exposing the IOL to tear film contaminants during insertion.

Injectors

Although some physicians still use foldable IOLs, more than 90% of lenses are now implanted with injectors. These devices provide more control, avoid the tear film, and can pass the lens through an incision of 3 mm or less. Manually loaded injectors are not foolproof, however, and there is the potential for misloaded and damaged IOLs upon injection into the eye. The surgeon or technician must coat the IOL and injector with a viscoelastic and then use a forceps to manually insert the lens into the injector, while being careful to bend the haptics correctly, avoid marring the optic, and not damage the IOL through excessive force.

The Hoya AF-1 (Hoya Surgical Optics, Inc., Chino Hills, CA) is the first IOL available on the US market that is fully preloaded in the company's iSert disposable aspheric delivery system. Because the lens comes ready for implantation, there is no question of whether the surgeon or the technician will load it into the injector properly and no risk that the lens will be damaged during the loading.

The device is entirely disposable, which may reduce patients' exposure to pathogens that can cause endophthalmitis and toxic anterior segment syndrome. The iSert injector system also saves time, as the surgeon or technician simply opens the packaging, injects a little viscoelastic into the injector, and inserts the lens into the eye (Figure 2).

Upgraded Designs

We have also begun using aspheric IOL designs to maximize image quality for patients. A degree of negative spherical aberration in the IOL (approximately -0.18 µm in the case of the Hoya IOL) can balance the positive spherical aberration of the average cornea. In addition, the proprietary design of the optic may also prove of benefit in cases of a mildly decentered lens or eyes with a large angle kappa. The Hoya IOL is available with a clear optic, UV protection, or a yellow chromophore that filters blue as well as UV light.

I anticipate that, within the next 5 years, all manufacturers will make their IOLs available in preloaded delivery systems. In fact, multiple preloaded lenses are already available in Europe and Asia.

CONCLUSION

OVDs have revolutionized phaco surgery, and progressive improvements in IOLs and insertion systems have evolved considerably to make modern phaco surgery a safe and efficient procedure that can restore patients' sight in minutes. I fully anticipate that the field will continue to advance with better instrumentation and more sophisticated techniques. When it is time for my cataract surgeries in a few decades, I want the procedure to restore the visual function I had as a teenager in a matter of minutes. ■

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