Clinical Benefits of AT-OVDs

How AT-OVDs facilitate both routine and complex cataract surgery.

BY SONIA YOO, MD, AND JASON JONES, MD

This article begins a series that will highlight the utility and versatility of advanced-technology OVDs (AT-OVDs) in cataract surgery. Here, Sonia Yoo, MD, of Miami and Jason Jones, MD, of Sioux City, Iowa, discuss which AT-OVDs they prefer in particular surgical situations, and why. To watch videos of the cases described herein, visit CRSToday.com and enter the keyword "Discovisc" in the search bar.

SONIA YOO, MD

Ophthalmic viscosurgical devices (OVDs) have transformed cataract surgery. The introduction of these agents represented one of the most significant improvements in phacoemulsification, greatly reducing endothelial damage and postoperative corneal edema and shortening surgical time and visual recovery.[1,2] The two main functions of OVDs are (1) to protect the endothelium and other intraocular structures, such as the iris, from the mechanical and ultrasonic forces used during cataract surgery, and (2) to maintain space in the anterior chamber and capsular bag during the surgery and while implanting an IOL.

With these goals in mind, I have found that the newer, advanced-technology (AT) OVDs such as DuoVisc OVD with VISCOAT and PROVISC OVDs (Alcon Laboratories, Inc., Fort Worth, TX) more effectively maintain space and stay in place during surgery compared with less-advanced viscoelastic products. Yet, these agents are fairly easy to remove from the eye at the end of surgery. I routinely use DuoVisc OVD, which contains the dispersive VISCOAT and cohesive PROVISC OVDs in a single package. I use VISCOAT OVD in the early stages of surgery to coat the endothelium. I may use PROVISC OVD underneath the VISCOAT OVD if I decide to use a soft-shell technique[3] in certain eyes, such as those with a compromised corneal endothelium. PROVISC OVD is ideal for maintaining space in the eye, such as to keep the capsular bag formed before I implant an IOL.[4]

If I am operating on a challenging eye, such as one with retinal issues or a crowded anterior chamber, I again usually use DuoVisc OVD, because the combination of the dispersive and cohesive agents provides extra protection and space in the eye. I have also used DisCoVisc OVD (sodium chondroitin sulfate sodium hyaluronate; Alcon Laboratories, Inc.) with great success. The advantage of DisCoVisc OVD versus DuoVisc OVD is that the former combines the benefits of a high-viscosity agent and a low-viscosity agent in a single syringe. The syringe of DisCoVisc OVD contains a larger volume than individual ampules, which is convenient for challenging eyes that require more protection.

I feel that DisCoVisc OVD is very good at protecting and maintaining the density of endothelial cells (Figure 1). The Texas Southwest Medical clinical study[5] showed that DisCoVisc OVD stays in the eye a little more readily than DuoVisc OVD. Of course, this means that I must take extra care to remove DisCoVisc OVD from inside the capsular bag and behind the IOL before closing the eye.

Traumatic Cataract in a Pediatric Eye

I recently operated on a pediatric eye that had sustained an injury from a piece of broken glass. The eye had a traumatic white cataract and a fairly dense, fibrotic, anterior capsular plaque. Because pediatric eyes are small and have an elastic anterior capsule that increases the risk of the capsulorhexis' running out peripherally, it is especially important to use OVDs that can keep the anterior chamber deep and the capsular surface flat. I used DisCoVisc OVD in this eye, because I needed reliable retention and extra space maintenance throughout the surgery.[6] Plus, I knew the 1-mL syringe would last the entire case.

The trauma had induced posterior synechiae, which I mechanically lysed with the AT-OVD before I stretched the pupil. In addition, the eye had a densely scarred anterior

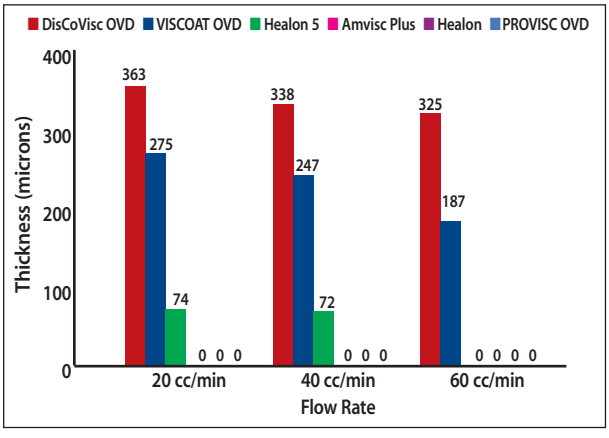

Figure 1. DisCoVisc OVD exhibited superior retention to other agents at various flow rates. Source: DisCoVisc OVD Product Insert.

capsule that was impenetrable with the cystotome. I was unable to use the vitrector, but eventually, I was able to use an MVR blade and retinal scissors to make an opening in the anterior capsule (Figure 2). The AT-OVD held the capsule flat through this entire process.[4]

Because this nucleus was quite soft, it did not require a lot of phaco power for removal; I primarily used I/A to extract it. The posterior capsule was also opaque; I was able to pierce it with the MVR blade and open it with retinal scissors. Next, I performed a limited anterior vitrectomy. During these processes, the retained AT-OVD protected and also maintained space in the small chamber.[4]

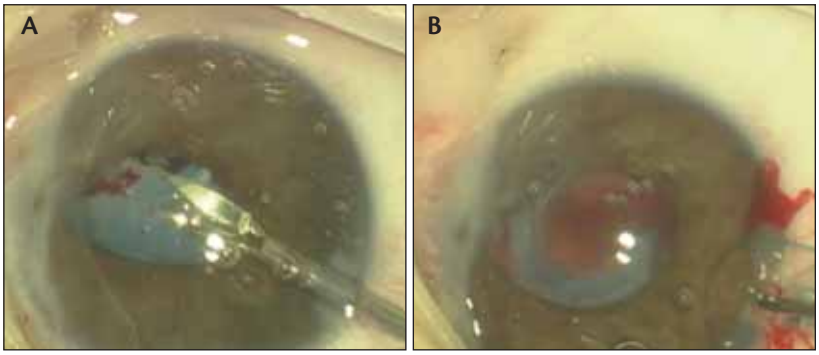

Figure 2. Dr. Yoo used scissors to open the anterior capsule, while DisCoVisc OVD kept the capsule flat (A). Then, she instilled more DisCoVisc OVD to open the capsular bag and sulcus (B) before implanting a three-piece IOL in the sulcus.

I instilled more DisCoVisc OVD to fill the capsular bag complex and keep it formed while I implanted a three-piece lens in the sulcus. Of course, I removed the OVD using I/A before closing the eye. Postoperatively, the patient's BCVA improved to the 20/30 range.

JASON JONES, MD

I have used both DuoVisc and DisCoVisc OVDs in surgery. I find that these AT-OVD agents, which are formulated with chondroitin sulfate, provide an extra element of retention in the anterior chamber that helps provide additional protection for the intraocular tissues.[7] My experience aligns with the results of a variety of key studies,[5,8-12] and this superior protection translates to better corneal clarity postoperatively.

Routinely, I use VISCOAT OVD at the beginning of my cases and PROVISC OVD to implant the IOL. The DuoVisc OVD package is very convenient in the OR, because it contains both products. I can take advantage of the properties of these two OVDs independently or combined in the eye. The retentive properties of VISCOAT OVD effectively protect the corneal endothelium while I operate;[9] almost as though the cornea does not know I am working underneath it. I also find that VISCOAT OVD enables me to achieve excellent clarity during surgery. In the early postoperative period, I have found that VISCOAT OVD helps enhance the "wow" factor for both routine patients and those who have upgraded to a premium IOL. The ability to routinely exceed patients' expectations—both immediately after surgery and through an easy, uncomplicated recovery period—is key to giving patients high-quality care. This level of performance also increases the practice's overall efficiency by reducing the number of follow-up visits.

AT-OVDs in Challenging Cases

Aside from routine use, AT-OVDs can help surgeons manage cataract surgery in eyes with either structural or pathologic challenges. For example, I routinely operate on patients with advanced Fuchs dystrophy of the corneal endothelium. These eyes carry a greater risk of corneal swelling and other potential intra- and postoperative issues. In a recent patient with Fuchs endothelial dystrophy, I used VISCOAT OVD, which remained in place as a protective coating on the corneal endothelium while I worked underneath it. Consistent with studies such as Dr. Oshika's,[13] my experience with other, more cohesive viscoelastics has shown that even minimal turbulence in the anterior chamber causes them to dislodge from the cornea and exit the eye in a blob. Obviously, exposing the endothelium would make a tenuous situation with a compromised cornea even more dangerous. Again, the higher negative charge of VISCOAT OVD[10] (due to its containing chondroitin sulfate) enhances its adhesion to the cornea and is a major factor in this agent's high-level performance in the eye.

Strategies for Success With Fuchs Dystrophy

I use several surgical strategies to ensure success when operating on eyes with Fuchs endothelial dystrophy. Some of these factors are beneficial in routine and other cataract surgeries as well.

1. I begin with a square clear corneal incision, because this configuration helps the wound seal at the conclusion of the case. Because I can comfortably use a 2.2-mm incision for all steps of the procedure with OZil IP Torsional Ultrasound on the INFINITI Vision System (Alcon Laboratories, Inc.), I feel the surgery disturbs less of the endothelium.

2. I fill the anterior chamber completely with VISCOAT OVD. I introduce the cannula through the paracentesis, cross the anterior chamber, and place the tip near the opposite angle. I instill a bolus of VISCOAT OVD and then

backfill across the anterior chamber, exchanging aqueous for VISCOAT OVD (Figure 3).

3. I size the capsulorhexis smaller than the IOL's optic to ensure that the anterior capsule overlaps the optic for 360º. This step helps keep the IOL stable both refractively and anatomically should the eye need an endothelial transplant. Overlapping the optic also helps to anatomically separate the eye if it requires an Nd:YAG posterior capsulotomy and an endothelial transplant.

4. To disassemble the nucleus, I use vertical chopping, and I work deep in the anterior chamber and capsular bag.

5. I target the IOL's power toward a postoperative refraction of approximately -1.00 D to allow for a future endothelial transplant and the hyperopic shift it may induce.

6. I evacuate the VISCOAT OVD from the endothelium using the I/A handpiece. I elevate the aspiration flow rate deep in the anterior chamber and then approach the endothelium. I can observe when the VISCOAT OVD shears from the cornea without bringing the I/A tip too close to the endothelium (Figure 4).

7. I flush the angle with balanced salt solution before hydrating the main wound to assist its closure. Flushing the angle helps to liberate the OVD and any nuclear particles, thereby avoiding postoperative issues such as elevated IOP.

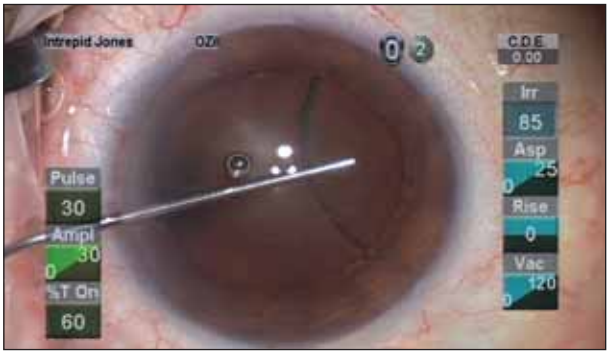

Figure 3. Dr. Jones backfilled the anterior chamber with VISCOAT OVD, displacing aqueous in the process.

Figure 4. Dr. Jones removed VISCOAT OVD from the endothelium using an elevated flow rate to keep the tip at a distance.

Other Benefits of ATOVDs

AT-OVDs can also be beneficial in the capsular bag in the presence of nuclear material. If an eye has loose zonules, the surgeon may want to use a dispersive OVD to viscoelevate the nucleus into the pupillary space for easier and safer phacoemulsification. VISCOAT or DisCoVisc OVDs are also useful in eyes with an open posterior capsule, because they help prevent vitreous prolapse, coat the intraocular structures, and protect the iris and any residual capsule. Furthermore, I rarely experience spikes in IOP using VISCOAT OVD.

Conclusion

DuoVisc and DisCoVisc OVDs contain both chondroitin sulfate and hyaluronic acid, which remain the most widely used ingredients in OVDs for protecting corneal endothelial cells. Beyond offering protection against the mechanics of surgery, there is evidence that AT-OVDs reduce the oxidative stress (damage from free radicals) to the corneal endothelium caused by phacoemulsification.[3] For me, the proof of these agents' advanced-technology status is my patients' clear corneas on the first postoperative day. ■

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DUOVISC® Viscoelastic System
DUOVISC® Viscoelastic System is designed to give two viscoelastic materials with different physico-chemical properties that can be used differently and/or sequentially to perform specific tasks during a cataract procedure. DUOVISC® Viscoelastic System consists of VISCOAT® Ophthalmic Viscosurgical Device and PROVISC® Ophthalmic Viscosurgical Device.

CAUTION: Federal law restricts this device to sale by or on the order of a physician.

Viscoat ® OVD (Sodium Chondroitin Sulfate – Sodium Hyaluronate) Ophthalmic Viscosurgical Device

Indications : Viscoat® OVD is indicated for use as an ophthalmic surgical aid in anterior segment procedures including cataract extraction and intraocular lens (IOL) implantation. Viscoat maintains a deep anterior chamber during anterior segment surgeries, enhances visualization during the surgical procedure, and protects the corneal endothelium and other ocular tissues. The viscoelasticity of the solution maintains the normal position of the vitreous face and prevents formation of a flat chamber during surgery.

Warnings: Failure to follow assembly instructions or use of an alternate cannula may result in cannula detachment and potential patient injury.

Precautions : Precautions are limited to those normally associated with the surgical procedure being performed. Although sodium hyaluronate and sodium chondroitin sulfate are highly purified biological polymers, the physician should be aware of the potential allergic risks inherent in the use of any biological material.

Adverse Reactions: Viscoat® OVD has been extremely well tolerated in human and animal studies. A transient rise in intraocular pressure in the early postoperative period may be expected due to the presence of sodium hyaluronate, which has been shown to effect such a rise. It is therefore recommended that Viscoat be removed from the anterior chamber by thorough irrigation and/or aspiration at the end of surgery to minimize postoperative IOP increases. Do not overfill anterior chamber.

ATTENTION: Reference the Physician Labeling/ Directions for Use for a complete listing of indications, warnings and precautions.

ProVisc® OVD (Sodium Hyaluronate) Ophthalmic Viscosurgical Device

Indications : ProVisc® OVD is indicated for use as an ophthalmic surgical aid in the anterior segment during cataract extraction and intraocular lens (IOL) implantation. Ophthalmic viscoelastics serve to maintain a deep anterior chamber during anterior segment surgery allowing reduced trauma to the corneal endothelium and surrounding ocular tissues. They help push back the vitreous face and prevent formation of a flat chamber during surgery.

Precautions : Postoperative increases in intraocular pressure have been reported with sodium hyaluronate products. The IOP should be carefully monitored and appropriate therapy instituted if significant increases should occur. It is recommended that ProVisc® OVD be removed by irrigation and/or aspiration at the close of surgery. Do not overfill anterior chamber. Although sodium hyaluronate is a highly purified biological polymer, the physician should be aware of the potential allergic risks inherent in the use of any biological material; care should be used in patients with hypersensitivity to any components in this material. Cannula assembly instructions should be followed to prevent patient injury.

Adverse Reactions: Postoperative inflammatory reactions such as hypopyon and iritis have been reported with the use of ophthalmic viscoelastics, as well as incidents of corneal edema, corneal decompensation, and a transient rise in intraocular pressure.

ATTENTION: Reference the Physician Labeling/ Directions for Use for a complete listing of indications, warnings and precautions.

DisCoVisc® Ophthalmic Viscosurgical Device
DisCoVisc® Ophthalmic Viscosurgical Device (Sodium Chondroitin Sulfate – Sodium Hyaluronate).

Description: DisCoVisc® Ophthalmic Viscosurgical Device has an intermediate cohesive/dispersive index (CDI) and can best be described as the first viscous dispersive viscoelastic and is optimized for the entire surgical procedure.

Indications: DisCoVisc® Ophthalmic Viscosurgical Device is indicated for use during surgery in the anterior segment of the eye. It is designed to create and maintain space, to protect the corneal endothelium and other intraocular tissues and to manipulate tissues during surgery. It may also be used to coat intraocular lenses and instruments during cataract extraction and IOL insertion.

Warnings: Failure to follow assembly instructions or use of an alternate cannula may result in cannula detachment and potential patient injury.

Precautions: Precautions are limited to those normally associated with the surgical procedure being performed. Although sodium hyaluronate and sodium chondroitin sulfate are highly purified biological polymers, the physician should be aware of the potential allergic risks inherent in the use of any biological material.

Adverse Reactions: DisCoVisc® Ophthalmic Viscosurgical Device was very well tolerated in nonclinical and clinical studies. A transient rise in intraocular pressure in the early postoperative period may be expected due to the presence of sodium hyaluronate, which has been shown to effect such a rise. It is therefore recommended that DisCoVisc® Ophthalmic Viscosurgical Device be removed from the anterior chamber by thorough irrigation and/or aspiration at the end of surgery to minimize postoperative IOP increases. Do not overfill anterior chamber.

ATTENTI ON: Reference the Physician Labeling/Directions for Use for a complete listing of indications, warnings and precautions.

CAUTION: Federal (USA) law restricts this device to the sale by, or on the order of, a physician.

Infiniti® Vision System
Infiniti® Vision System Indication: The INFINITI® Vision System with OZil® IP is indicated for emulsification and removal of cataracts, vitreous aspiration and cutting associated with anterior vitrectomy, and bipolar coagulation.

Caution: Federal (USA) law restricts this device to sale by, or on the order of, a physician.

Warnings: Appropriate use of INFINITI® Vision System parameters and accessories is important for successful procedures. Use of low vacuum limits, low flow rates, low bottle heights, high power settings, extended power usage, power usage during occlusion conditions (beeping tones), failure to sufficiently aspirate viscoelastic prior to using power, excessively tight incisions, and combinations of the above actions may result in significant temperature increases at incision site and inside the eye, and lead to severe thermal eye tissue damage.

Adjusting aspiration rates or vacuum limits above the preset values, or lowering the IV pole below the preset values, may cause chamber shallowing or collapse which may result in patient injury.

When filling handpiece test chamber, if stream of fluid is weak or absent, good fluidics response will be jeopardized. Good clinical practice dictates the testing for adequate irrigation and aspiration flow prior to entering the eye.

Ensure that tubings are not occluded or pinched during any phase of operation.

The consumables used in conjunction with Alcon instrument products constitute a complete surgical system. Use of consumables and handpieces other than those manufactured by Alcon may affect system performance and create potential hazards.

AEs/Complications: Use of the NeoSoniX®, OZil® torsional, U/S, or AquaLase® handpieces in the absence of irrigation flow and/or in the presence of reduced or lost aspiration flow can cause excessive heating and potential thermal injury to adjacent eye tissues.

Attention: Reference the Directions for Use labeling for a complete listing of indications, warnings and precautions.