Pearls for Iris Prolapse

BY PABLO ARREGUI, MD; JAMES T. BANTA, MD; DONALD R. NIXON, MD; AND THOMAS A. OETTING, MS, MD

How do you handle an iris that either wants to prolapse out of the incision or has already done so?

PABLO ARREGUI, MD

The iris prolapses out of the wound because the pressure behind the iris is greater than the pressure in front of it. To solve this problem, the surgeon needs to identify the cause and then equalize/reverse the pressure gradient. Fortunately, he or she usually has time to evaluate the situation and determine the underlying problem. Some of the most common causes include an overly aggressive hydrodissection (such that balanced salt solution [BSS; Alcon Laboratories, Inc.] is trapped behind the lens), the presence of an ophthalmic viscosurgical device (OVD) behind the IOL, and intraoperative floppy iris syndrome (IFIS). Other causes include a poorly dilated pupil; hydrated vitreous from a ruptured capsule or BSS getting pushed through the zonules (which usually occurs with a dispersive OVD); a leaking or poorly constructed incision; a patient's Valsalva maneuver due to pain or an overly tight lid speculum; a previously traumatized iris; suprachoroidal hemorrhage (in which case the surgeon has a bigger worry than the iris); and a shallow anterior chamber.

When treating iris prolapse, the surgeon may instinctively want to push the iris back into the anterior chamber, but he or she must resist this urge, because it almost never works. Rather, he or she must identify the specific cause and tailor the solution to it. The one common factor among the aforementioned causes is that the treatment seldom involves going through the primary incision.

In most cases, once the surgeon has identified and treated the problem, the iris will no longer prolapse. If it does, the surgeon should consider lowering the bottle height and decreasing the flow and vacuum of the phaco machine. He or she may want to add a small amount of viscoelastic through the paracentesis over the iris before inserting any instrument through the primary incision.

Although iris prolapse does not usually cause significant postoperative visual problems, this surgical inconvenience can quickly turn into a disaster. Significant iris damage can lead to severe and chronic visual complaints.

Whenever possible, prevention is the key. Surgeons must anticipate and prepare for problems based on the patient's medication list and A-scan. They should also make sure the wounds are well constructed, avoid overinflating the anterior chamber during hydrodissection, and ensure the patient's comfort before and throughout the procedure. Of course, a careful surgical technique will help to minimize the likelihood of damaging the iris.

JAMES T. BANTA, MD

Iris prolapse is common and can be quite frustrating. Prevention and treatment requires an understanding of the physics behind this most unwelcome phenomenon. Certain conditions predispose the iris to floppiness, or a lack of integral tone. Nevertheless, iris prolapse may occur anytime the pressure in the eye is elevated and access to the exterior creates a gradient favorable for rapid movement. Because I see iris prolapse most commonly during hydrodissection, I will limit my comments to this stage of phacoemulsification, although the principles apply to any stage of the process.

During hydrodissection, as BSS is directed around the lens, fluid often becomes trapped behind the lens, causing the anterior chamber to shallow and reducing its effective volume. The eye is typically filled with viscoelastic, a substance that is relatively "noncompressible" and can cause the pressure to rise rapidly. Because the caliber of the instrument used for hydrodissection is typically small and cannot occlude the lumen of the temporal incision, a massive pressure gradient can rapidly form. As the viscoelastic leaves the eye under pressure, the iris simply follows.

I train residents, and problems that I frequently see include overfilling the anterior chamber with viscoelastic, using too much magnification such that it is difficult to see prolapse as it occurs, and allowing too much BSS to become trapped behind the lens before repositioning it. These three factors create a "perfect storm" for iris prolapse. If the iris starts moving toward the wound during hydrodissection, the first step is to gen-

tly press down on the lens with the cannula to remove the BSS trapped behind it and thereby reestablish the anterior chamber's normal depth. This maneuver will rapidly lower the pressure gradient in the eye and often restore the iris to a normal position. If a small amount of the iris comes out of the eye, I move my cannula over the iris to staunch its exodus, press down gently on the lens to reposition it in the bag, and then rotate the nucleus. It is amazing how often the iris will reposition itself with a simple rotation of the lens.

If a large portion of the iris has exited the eye, and the IOP is high (always check), the only way to reposition the iris is to lower the eye pressure and lower the pressure gradient. As before, I first make certain the lens is sitting in the bag without BSS trapped behind it. Once the normal anatomy of the anterior chamber has been reestablished, viscoelastic must be removed to lower the pressure gradient. I keep the cannula in the eye and press down on the posterior lip of the temporal corneal wound (while trapping the iris under the cannula) to allow viscoelastic to exit the main temporal wound. I reduce the IOP as much as possible to allow the iris to reposition itself. Once the pressure is low, the iris can be gently tucked back into the eye or swept into the eye from a paracentesis.

At this point, the surgeon can proceed in one of two ways. If the pupil's size is adequate, the lens is appropriately hydrodissected, and the iris is unlikely to prolapse again with a properly pressurized eye, phacoemulsification may proceed normally. Once the eye is pressurized and the appropriately sized phaco needle is occluding the temporal wound, further prolapse is unlikely. Alternatively, if the pupil's size is inadequate, further hydrodissection is necessary, or the iris is very atonic and likely to prolapse again, I like to use iris hooks (at least one directly under the wound) to prevent further problems.

DONALD R. NIXON, MD

The approach to iris prolapse in cataract surgery depends on the circumstances at the time of presentation. Variables to consider include when in the procedure the iris prolapsed or attempted to prolapse, what was done at the beginning of the surgery to address this potential, whether there has been any damage to the structure of the iris as a result of the prolapse, and finally, what the pupil's miotic response is to the irritation. The most common presentation of this phenomenon is associated with the use of α 1-antagonist agents such as tamsulosin (Flomax; Boehringer Ingelheim Pharmaceuticals, Inc.) and similar agents that, either actively or in the past, led to IFIS. Ultimately it is the hydrodynamic force of the irrigation causing the prolapse resulting from an unequal pressure gradient driving fluid and finally iris out of the eye.

> "If the prolapse occurs after phacoemulsification, slightly hydrating the primary and sideport incisions will decrease leakage."
> —*Donald R. Nixon, MD*

If the prolapse occurs after phacoemulsification, slightly hydrating the primary and sideport incisions will decrease leakage. Additionally, the use of a "dam" of a dispersive OVD at the internal surface of the wound and the subincisional space will keep the iris back and further reduce wound leak. With this closed system, the surgeon can reduce the bottle height and proportionally reduce the vacuum and flow rates to minimize the pressure gradient but still remain efficient. In my experience, a venturi vacuum is an excellent option because it allows me to work at lower vacuum levels that do not require full occlusion. The advantages of venturi are that it extends the reach of the vacuum and facilitates my ability to work more centrally in the eye during both phacoemulsification and irrigation/aspiration, which I now use for both.

If iris prolapse occurs, or if the iris is at the wound during phacoemulsification, a review of what was done at the beginning of surgery to mitigate prolapse determines the surgeon's future actions. Preoperative atropine 1% and an intraoperative unpreserved α-adrenergic agent combined with 1% unpreserved lidocaine are commonly used in IFIS cases, but adjusting fluidics is the key to maintaining the pressure balance between inflow and outflow. Each time I evaluate a new phaco tip and wound size, I also critically match it to a specific steel blade design to achieve the best fit, which I describe as hand in glove, to allow for proper movement, minimal leakage, and excellent chamber stability. The same matching can be applied to the sideport and chopper to create an optimal closed system that allows for low-flow parameters without compromising efficiency.

OVDs are helpful in cases of prolapse with pupillary dilation to help obtain and maintain working space. Sometimes, a viscoadaptive OVD such as Healon5 (Abbott Medical Optics Inc.) is all that is needed, but in moderate to severe cases of prolapse, both a dispersive and cohesive OVD are necessary. These can be used at any time during the phaco

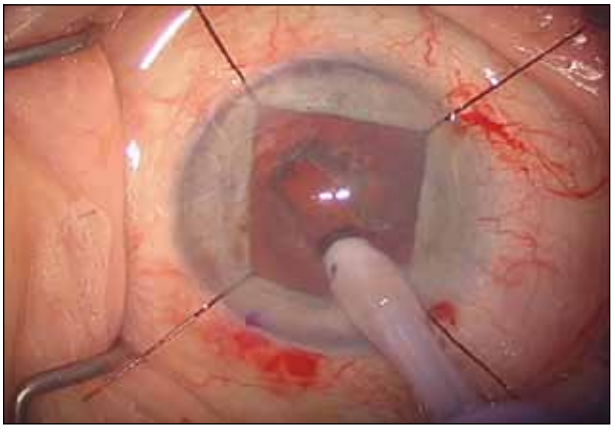

Figure 1. Iris hooks in a diamond configuration.

procedure if prolapse occurs. My preference is initially to place a moderate bead of Healon (Abbott Medical Optics Inc.) in the periphery of the iris toward the meshwork around the entire circumference (360°) and then use a soft shell technique as described by Steve A. Arshinoff, MD, FRCSC.[1] The bead of cohesive OVD makes it easier to clear the angle at the end of the case, and if there are any small nuclear fragments in the periphery, they are removed like flies attached to fly paper on the Healon5. A dispersive OVD such as Healon Endocoat (Abbott Medical Optics Inc.) can be supplemented during the phacoemulsification to maintain the iris' position and protect the pupil sphincter from the irritation caused by the phaco energy and the turbulence of BSS that stimulate miosis.

For mechanical pupillary dilation, I use the 6.25-mm Malyugin Ring (MicroSurgical Technology). My trick for the device's insertion via a 2.2-mm incision is first to use a cohesive OVD to elevate the iris away from the lens so that I have the highest chance of catching three of the four loops in the iris margin with a single pass. This technique also makes the final loop easier to secure. This approach is especially important for minimizing catching the capsular margin if the ring's insertion occurs after the capsulorhexis is created. The device is easy to remove, with little chance of trapping a piece of nuclear material behind the iris.

THOMAS A. OETTING, MS, MD

Iris prolapse can create problems during surgery and, more important, can lead to iris damage and dysfunction.[2] The problem typically arises from a wound that is too short or from an iris that is floppy or does not dilate. The actual prolapse of the iris usually occurs during hydrodissection and can create transillumination defects, loss of iris tissue, iridodialysis, and hyphema. It is important for eye surgeons to know how to preserve the iris when prolapse occurs and how to prevent the complication from occurring in the first place.

When the wound is too short, one of the best options to prevent iris prolapse is simply to close the short incision and make a longer wound at another site. Moving the incision is often difficult, as the brow or a bleb may get in the way. A simple solution is to place a single iris hook under the incision to pull the iris under it, preventing prolapse. If the pupil is small, it can be useful to place four hooks in a diamond configuration, with one hook under the wound to both prevent iris prolapse and open the pupil (Figure 1).[3] Iris rings such as the Malyugin Ring can be used, but if the wound is very short, the iris can still prolapse. If the iris prolapses even with a Malyugin Ring in place—a subincisional hook is a valuable supplement (Figure 2).

The most common time for the iris to prolapse is during hydrodissection; when the fluid wave passes around the lens and exits the eye, it takes the iris out with it. Excessive viscoelastic, especially the dispersive type, can increase the risk of iris prolapse. I like to remove viscoelastic above the lens before hydrodissection to help prevent this complication. After removing some of the dispersive viscoelastic, I gently perform hydrodissection, watch the subincisional iris, and apply less fluid pressure if the iris moves toward the wound.

When the patient is at risk for IFIS from an α blocker, especially the selective tamsulosin, or some other cause such as ischemia, it may be best to prevent iris prolapse with iris hooks or a Malyugin Ring.[4-6] The risk of IFIS increases when the pupil starts off small.[4] In patients on α blockers (selective or nonselective) with small pupils, I consider using a 6.25-mm Malyugin Ring. In patients on a selective α blocker with a large pupil, I consider using either a large Malyugin Ring (7 mm) or a single subincisional iris hook. In patients with a small pupil and a narrow angle, I usually place iris hooks, because the anterior chamber is already tight.

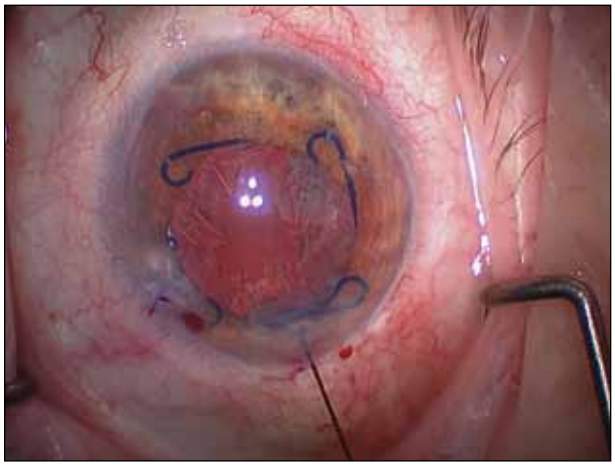

Figure 2. Iris prolapse despite a Malyugin Ring.

Figure 3. Releasing fluid pressure and rocking the lens through the paracentesis before repositioning the iris.

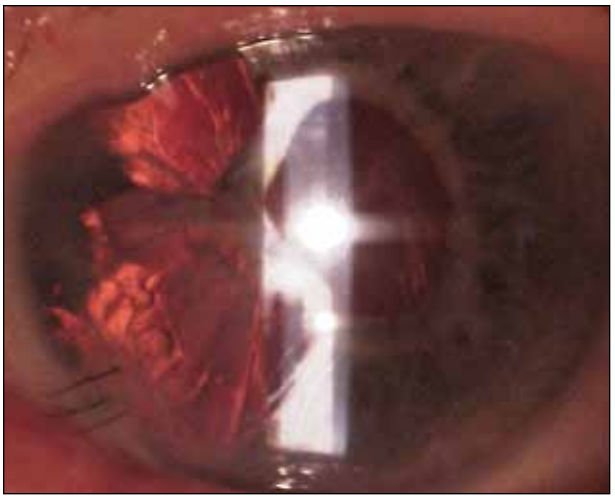

Figure 4. Severe iris damage from prolapse in a patient taking tamsulosin.

When iris prolapse occurs, the emphasis should be on preserving iris tissue and preventing further prolapse. The first step after the iris prolapses is to use the paracentesis to remove fluid pressure from within the eye, which is pushing out the iris. Gentle rocking of the lens will help to release fluid trapped behind it, which will lower the pressure and deepen the anterior chamber (Figure 3). Then, the surgeon may use a viscoelastic cannula to gently reposition the iris. After the iris is back in position, he or she can consider placing an iris hook under the wound to keep the iris from further prolapse. Rarely, iris prolapse will occur in the presence of posterior pressure from a choroidal hemorrhage, choroidal effusion, or misdirection of aqueous.

Severe iris prolapse can cause functional damage to the iris—one of the most devastating complications of cataract surgery (Figure 4). The use of devices such as iris hooks, especially under the main incision, can prevent prolapse. ■

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