

Iris Prolapse in a Small Pupil

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CASE PRESENTATION

A patient with a small pupil underwent phacoemulsification of a symptomatic cataract. The surgeon used a 3-mm metal keratome to create a near-clear, approximately 2-mm, triplanar incision at the limbal blood vessels (Figure 1). Despite the small pupil, the surgeon was able to complete an adequately sized capsulorhexis by means of viscomydriasis with Healon5 (Advanced Medical Optics, Inc., Santa Ana, CA). Pupil stretching was not performed. After gentle hydrodissection, the iris collarette prolapsed within the clear corneal tunnel. The iris margin remains within the anterior chamber. The limbal blood vessel to the left denotes the paracentesis site.



Figure 1. The small pupil exhibits iris prolapse (arrows). Dots outline the incision.

HOW WOULD YOU PROCEED?

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First, the surgeon must determine why this iris prolapse is occurring. Not correcting the cause will lead to repeat iris trauma, a loss of pigment, and further tissue prolapse. In this case, two factors seem to be contributing to the iris prolapse: (1) a wound made too peripherally and too short

(as a result of a premature entry into the anterior chamber), with respect to the size of the pupil; and (2) increased IOP after hydrodissection. With respect to wound architecture, surgeons should consider a slight anterior displacement of the clear corneal wound in cases of miotic pupils. In addition, it is probably best to dissect a tunnel slightly longer than 2mm, which will place the entry point into the anterior chamber at a more advantageous position and help prevent iris capture.

Obviously, at this stage, it is not possible to change the wound design, but it is possible to relieve some of the contributing hydrostatic forces that are causing the iris to prolapse. The first step is to release some fluid from the anterior chamber by gently depressing the posterior lip of the paracentesis. Next, the surgeon should inject either Healon5 or a dispersive ophthalmic viscosurgical device (OVD) through the wound, anterior to the peripheral iris. A slight posterior direction of the cannula sometimes allows the iris tissue to be tucked underneath the wound's posterior lip. Successfully executing these maneuvers will temporarily stabilize the iris. At this point, it would be beneficial for the surgeon to ensure that the nucleus has been properly hydrodissected by rotating it with the cannula.

The width of the wound merits consideration. A 3-mm keratome may be too large for some phaco needles. For example, a 2.65-mm incision may be sufficient when using the Millennium microsurgical system (Bausch & Lomb, Rochester, NY). If iris prolapse occurs around the phaco needle and sleeve, placing a peripheral, interrupted 10–0 nylon suture at the wound will avoid an uncontrolled outflow of irrigation fluid accompanied by additional iris prolapse.

Before continuing, the surgeon should consider how he will enter and exit the eye. It is important to maintain as stable an anterior chamber as possible, because major shifts in pressure will produce gradients that may favor further iris prolapse through the wound. Before entering the eye, the surgeon should fill the anterior chamber with an OVD. The phaco needle should be introduced through the

wound bevel down to facilitate its entry and without irrigation. Once the probe is inside the eye, irrigation may commence. To ensure proper expansion of the anterior chamber, it may be necessary to raise the irrigation bottle to keep the iris posterior to and away from the wound. The surgeon should use a chopping technique and count the nuclear fragments to guarantee complete removal of the lens, because the pupil is small and some fragments may hide underneath the iris. When completing the phacoemulsification, the surgeon should stop the irrigation prior to exiting the eye in order to minimize the creation of a gradient conducive to iris prolapse.

My preference for cortical removal is bimanual I/A (using a 23-gauge, curved, polished tip from Katena Products, Inc. [Denville, NJ]) through the original paracentesis and a second paracentesis created on the other side of the phaco wound. This technique provides superbly controlled fluidics and a stable anterior chamber. Furthermore, it transfers the focus of the action from the wound (through which the iris could prolapse again during coaxial I/A) to the center of the anterior chamber, which may be filled in a more controlled fashion. In addition, I can use the instruments to explore the posterior chamber and capsular bag for any remaining lens fragments. Again, it would be important to start or stop irrigation at appropriate times before entering or exiting the eye in order to minimize the pressure gradient. After implanting an IOL per my usual technique, I would remove the OVD and inject acetylcholine to constrict the pupil and thereby further minimize the risk of prolapse.

I find that the approach I have described works in most cases of iris prolapse. Problems can arise, however, that cause significant damage to the peripheral iris. At times, it may be necessary to create a small peripheral iridectomy to relieve some of the pressure generated posteriorly to the iris. In such cases, it is possible to repair the defect using the Sieser slip-knot technique at the conclusion of the surgery. Other situations of problematic intraoperative irides include atrophic conditions, excessive manipulation or mechanical dilation, shallow anterior chambers due to posterior vitreous pressure (retrobulbar block), intumescent cataracts, hyperopic or nanophthalmic eyes, or frail irides. In these cases, the surgeon may have to perform iris stabilization with iris hooks, localized anterior-vitreous aspiration, or pars plana vitrectomy to create an adequate working space.

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Unfortunately, once the iris emanates from a clear corneal incision, it will tend to continue emerging throughout the case, so the surgeon must deal with the problem upon first recognizing it. Iris prolapse may be related to patient

factors (modifiable and nonmodifiable) and surgical techniques. Modifiable patient factors that can be addressed intraoperatively include positive pressure, which may be due to lid squeezing, the speculum, and/or increased venous tone. Placing the patient in a reverse Trendelenberg position (head up), relieving any neck compression (ie, from the surgical gown), relaxing the lid speculum, or using a lid block may rectify the problem. Providing further intravenous sedation also often helps to alleviate tension.

The first step in managing iris prolapse is to reduce the forces or pressure within the anterior chamber that are pushing out the iris. The surgeon must refrain from initially pressing the iris back into the eye with an instrument or injecting more viscoelastic through the main incision, although these are common responses. Instead, the appropriate action to take in this case would be to remove viscoelastic from the anterior chamber through the sideport incision, especially from under the subincisional iris (by performing aspiration with the cannula located beneath the iris) and from the distal anterior chamber. The subincisional iris may need to be repositioned in the eye, a maneuver that can be performed with a gentle sweep of a bent cannula, again through the sideport. One should avoid poking at the iris through the main incision, or further iris trauma may result.

Once the anterior chamber has been decompressed, and the iris is back in place, a small bolus of a highly cohesive viscoelastic can be positioned over the subincisional iris. This step will create localized room where the surgeon can place the phaco tip through the incision without irrigation. In cases of continued difficulty, the surgeon can place a modified phaco glide through the wound to hold back the iris while inserting the phaco tip into the eye. In extreme situations, the surgeon can perform a pars plana tap and chamber reformation with a vitreous cutter to create additional space in the anterior chamber where the iris can prolapse. It is essential to remove instrumentation from the eye with minimal or no irrigation in order to avoid forcing the iris to extrude again.

Phacoemulsification in the presence of a small pupil poses unique surgical considerations, but this floppy iris is a risk factor for further miosis or iris entrapment within the phaco tip. One must avoid contact between the pupil or iris and the instrumentation or lens tissue. It is therefore important to prevent significant fluctuation in the volume of the anterior chamber. Should the pupil become too small for the surgeon to perform the procedure safely, pupil stretching or cutting is inadvisable, because it will likely create further iris flaccidity and prolapse. The use of iris retractors, including one placed subincisionally (through a paracentesis created posterior to the main incision),¹ can provide adequate visibility and avoid tenting of the iris anteriorly at the incision site. Alternatively, placing a pupil expan-

sion ring such as the Morcher Pupil Dilator (Morcher GmbH, Stuttgart, Germany) may—although cumbersome—achieve adequate and safe pupillary expansion.

Finally, upon completion of the case, the surgeon must ensure the seal is watertight and place a single 10–0 nylon suture at the main incision site after injecting Miochol-E (Novartis Ophthalmics, Inc., Duluth, GA) into the eye in order to constrict the pupil.

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With iris prolapse, one must first identify the cause. For example, was the construction of the incision faulty, was too much OVD injected or excessive hydrodissection performed, or is there a suprachoroidal hemorrhage with a tense globe? I would decompress the anterior chamber by burping the paracentesis incision to see if I could easily reposit the iris. One must be careful to position any OVD directly over the preincisional iris and not to allow any viscoelastic to flow behind the iris in this area.

Iris prolapse with such a small pupil is frequently due to intraoperative floppy iris syndrome (IFIS). John Campbell, MD, and I coined this term to describe a new small pupil syndrome that we have discovered is caused by tamsulosin (Flomax; Boehringer Ingelheim Pharmaceuticals, Inc., Ridgefield, CT), a systemic alpha 1-blocker commonly used for benign prostatic hypertrophy. Our report has been accepted for publication,² and we will present our clinical study of this syndrome at the ASCRS annual meeting in April. Based upon our recently published preliminary report,³ the ASCRS issued a special advisory to its members in January 2005.

In brief, IFIS has three distinct characteristics: (1) an iris that undulates and billows in response to normal, intraocular fluid currents; (2) a strong tendency for the iris to prolapse to the phaco and sideport incisions; and (3) progressive intraoperative miosis. The last is not prevented by mechanical iris stretching or partial thickness sphincterectomies. Frequently, the preoperative dilation is poor, and both brown and blue irides are affected. We believe that this lack of iris rigidity is due to a loss of the normal tone of the iris dilator muscle, which appears to be strongly and preferentially blocked by tamsulosin. We recommend temporarily stopping tamsulosin 1 to 2 weeks before surgery. Doing so can result in a larger surgical pupil and less floppiness to the iris. Nevertheless, we have also seen that IFIS can still occur 1 to 2 years after the cessation of Flomax, so there appears to be a variable degree of semipermanent change in some eyes. Iris retractors or a pupil expander ring are excellent methods by which to achieve and maintain a large pupillary diameter in IFIS. Bimanual microincisional phacoemulsification may reduce, but does not always prevent, the iris prolapse.

In this case, I would ask the patient on the operating table if he were taking tamsulosin. If so, I would employ iris retractors in a diamond configuration, as suggested by Oetting and Omphroy,¹ while being careful not to hook the edge of the capsulorhexis.

Most surgeons currently employ mechanical stretching techniques for small pupils during cataract surgery, but they will be ineffective for IFIS. Thus, determining a history of tamsulosin use preoperatively allows one to anticipate IFIS and choose another method of managing a small pupil. Such planning is important, because it is difficult to insert iris hooks or a pupil expander ring after the creation of the capsulorhexis. ■

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