Sudden Iris Prolapse and Firming of the Globe

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CASE PRESENTATION

A corneal/anterior segment fellow was performing phaco surgery on the left eye of a 74-year-old female with a very dense cataract. Although the operation appeared to be relatively routine, it was taking a bit longer than usual, and the fellow noted that the chamber was becoming hard to maintain. After injecting a dispersive viscoelastic agent in an attempt to deepen the chamber and viscodissect the remaining cortex, he saw the iris prolapse suddenly (Figure 1). Attempts to reposition the iris were unsuccessful, and the eye had become quite firm. How would you manage this case?

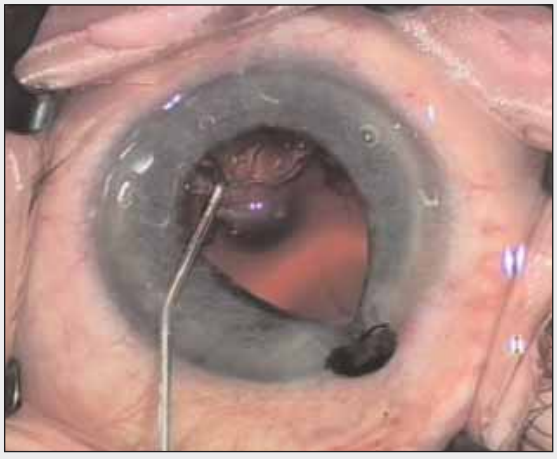

Figure 1. The iris has prolapsed due to progressive positive pressure during a prolonged cataract surgery.

ROBERT KAUFER, MD

One must think about two things in this situation, a choroidal hemorrhage and aqueous misdirection syndrome, in that order of importance. The fact that the prolapse happened while the fellow was placing an ophthalmic viscosurgical device (OVD) in the anterior chamber and not before suggests aqueous misdirection syndrome, although the possibility of a choroidal hemorrhage requires serious consideration. The latter is a highly unusual complication but also a very dangerous one if not addressed right away.

First, the surgeon should cease cortical cleanup and close the eye. Time is crucial, and there is little cortex left. In order to replace the protruding iris, the surgeon can sweep it with a blunt second instrument placed through the paracentesis and then suture the incision. Sometimes, instilling Healon5 (Advanced Medical Optics, Inc., Santa Ana, CA) assists the suturing process.

Once the eye is closed, the surgeon must make a diagnosis. An evaluation with an indirect ophthalmoscope or the use of a 78.00 D Ocular Osher Maxfield lens (Ocular Instruments, Bellevue, WA) to view the posterior segment will either reveal a normal periphery (indicating aqueous misdirection syndrome) or an elevated choroidal mass (indicating a suprachoroidal hemorrhage). The former scenario occurs when irrigating fluid passes into the vitreous through intact zonules or through a zonular or capsular tear. The zonular/iris diaphragm acts like a one-way valve. Fluid flows into the vitreous and cannot escape. Vitreous hydration results, expanding the volume of vitreous and subsequently elevating pressure in the posterior segment. As this pressure builds, the lens and iris move forward, markedly decreasing the working space in the anterior chamber. Continuing to operate would cause more fluid to pass into the vitreous, and the problem would worsen.

A suprachoroidal effusion occurs when the short posterior ciliary vessels rupture. A subsequent outpouring of plasma and blood into the suprachoroidal space elevates the pressure in the posterior segment and causes the chamber to become shallow, which make it difficult for the surgeon to maneuver in such a small space. The resultant increase in IOP limits the total amount of extravasated material, and it effectively tamponades the continued accumulation of fluid and prevents a hemorrhage. That is why it is so important to close the eye as quickly as possible.

Aqueous misdirection syndrome can be treated in various ways. I would wait 24 to 48 hours to finish

removing the cortical remnants and place the IOL. A more aggressive approach involves alleviating the increased IOP by performing a pars plana vitreous tap. One inserts a 23-gauge needle 3 mm posterior to the limbus and directs it toward the central anterior vitreous until the needle's tip is visible through the pupil. Slowly withdrawing 0.1 to 0.3 mL of liquid vitreous should deepen the anterior chamber sufficiently to allow the completion of the cataract procedure. An alternative, albeit slower, treatment is to administer Diamox (500 mg in an IV push) (Wyeth Pharmaceuticals, Philadelphia, PA) and/or mannitol (1 to 2 g/kg of a 25% solution) intravenously. The surgeon should wait approximately 20 minutes for the drug(s) to take effect, the eye to stabilize and soften, and the chamber to deepen.

> "The best approach to a suprachoroidal effusion/hemorrhage is no treatment at all."
> —Robert Kaufer, MD

The best approach to a suprachoroidal effusion/hemorrhage is no treatment at all. Continuing the cataract procedure and allowing the chamber to become shallow gives the hemorrhage more space to expand. Closing the eye firmly and waiting 1 week for the hemorrhage to resolve should permit the surgeon to finish the case safely.

As with most complications, the key to successfully completing cataract surgery in the presence of a shallow anterior chamber is recognizing the problem early, making a sound diagnosis, thoughtfully assessing one's surgical options, and proceeding with a suitable strategy for management.

BONNIE AN HENDERSON, MD

There are several possible etiologies for this presentation. The cause could be as simple as an overabundance of injected viscoelastic solution or aqueous misdirection syndrome with an OVD injected into the vitreous cavity. Anytime the eye suddenly becomes firm, however, especially with iris prolapse or flattening of the anterior chamber, the surgeon must suspect a suprachoroidal hemorrhage or effusion until proven otherwise. Because there is often significant pain associated with a hemorrhage, asking patients if they are experiencing any discomfort can help confirm the diagnosis. While considering the potential etiologies, the surgeon's first step is to stabilize the eye by closing the wound with sutures. If possible, the iris tissue should be swept back into the eye and the wound secured as quickly as possible. After closing the eye, the surgeon should examine the fundus with indirect ophthalmoscopy or with a handheld lens such as the Ocular Osher Maxfield lens.

If a suprachoroidal hemorrhage is confirmed, the eye should be left aphakic, and the surgery should be aborted. Most retina specialists would not recommend draining the hemorrhage at the initial surgery but rather allowing the hemorrhage to stop and become organized. If the iris cannot be repositioned in the eye, the surgeon can perform an iridectomy, if needed, to close the wound. Because an iridectomy can always be corrected at a later time with a pupilloplasty, a small loss of iris tissue is a reasonable price to pay for a closed and stable eye.

If no suprachoroidal hemorrhage has occurred in this eye, a possible cause of the iris prolapse and hardening of the eye is an overabundance of the injected dispersive OVD. In this case, the viscoelastic solution should be aspirated out of the eye. The surgeon should gently insert the I/A handpiece into the eye to avoid significant chafing of the iris and loss of tissue. If the handpiece cannot be inserted through the original corneal incision, the surgeon can enlarge the paracentesis port slightly to allow the insertion of a split aspiration handpiece to remove the OVD. Once the pressure in the eye has returned to normal, the iris tissue can be placed back in the eye, and the surgery can continue as usual. The surgeon should carefully avoid further overinflation with a dispersive OVD; repeated iris prolapse is common, because the iris can become stretched and floppy after the initial prolapse.

If the surgeon suspects aqueous misdirection syndrome and has ruled out the other aforementioned etiologies, a pars plana vitrectomy (PPV) would lessen the forward pressure and disrupt the pupillary block.

RICHARD S. HOFFMAN, MD

Positive posterior pressure can result from tight lids and lid speculums, excessive volumes of retrobulbar anesthetics, choroidal effusions and hemorrhages, and intraoperative aqueous misdirection from the phaco or I/A handpiece. Because the positive pressure developed toward the end of the procedure, the lid speculum and anesthetic are not likely to be the cause. There is no obvious choroidal shadow in the red reflex in Figure 1, so the likely cause for the shallowing anterior chamber, iris prolapse, and elevated IOP is aqueous misdirection syndrome. Nonetheless, it is important to rule out a choroidal effusion or hemorrhage, because the presence of either would dramatically change the management of the case.

Although no surgeon enjoys seeing the iris prolapse

out of the wound, it is probably best to leave the tissue in the incision until the cause of the positive pressure has been determined (this statement assumes that the operating surgeon made an unsuccessful attempt to sweep the iris out of the wound using the OVD cannula through the sideport incision). A quick view of the posterior pole with either an indirect ophthalmoscope or a sterile fundus contact lens would ensure that the cause of positive pressure is not a choroidal hemorrhage.

Intraoperative aqueous misdirection syndrome can occur when balanced salt solution is forced through compromised zonules and into the posterior segment, where excessive vitreous hydration then develops. The added difficulty of this case and extended surgical time most likely created a scenario of some zonular compromise and excessive irrigation into the eye with resulting vitreous hydration. Because this eye still requires the removal of residual cortex and the placement of an IOL, the quickest way to ensure control of the anterior segment would be to decompress the posterior segment. One could do so with an aspirating 25-gauge needle or a bare vitrector. A small scleral incision placed 3.5 mm posterior to the limbus in the infero- or superotemporal quadrant would allow for a limited dry virectomy with a bare 25-gauge vitrector. The surgeon could also perform aspiration with a 25-gauge needle. By retracting the conjunctiva to the side prior to placing the incision through the conjunctiva and sclera, the surgeon would not need to suture the incision, because intact conjunctiva would reposition itself over the scleral incision following the vitrector's removal.

> "One must be relatively certain that the cause of iris prolapse is aqueous misdirection syndrome before performing a vitrectomy."
> —Michael L. Nordlund, MD, PhD

After decompressing the eye, the surgeon could reposition the iris by sweeping it out of the main incision with the OVD cannula passed through the sideport incision. He could perform dry aspiration of the remaining cortex with a 26-gauge cannula and place additional viscoelastic into the anterior segment as needed. With this approach, the surgeon would not need to inject more balanced salt solution into the eye, which might risk recreating the positive posterior pressure. The IOL's insertion should be routine. Utilizing a thin cohesive

OVD for the lens' insertion would facilitate the agent's removal at the conclusion of the procedure through a manual exchange of balanced salt solution for the OVD. The surgeon could also attempt to remove the OVD with an I/A handpiece and the bottle set low.

MICHAEL L. NORDLUND, MD, PHD

Common causes of iris prolapse are poor wound construction, intraoperative floppy iris syndrome, and increased posterior pressure. In this case, the prolapse occurred suddenly, late in the surgery, and was associated with increased firmness of the globe. It is therefore likely that the iris prolapse resulted from increased posterior pressure. The two most common causes of acute increases in posterior pressure are a suprachoroidal hemorrhage and aqueous misdirection syndrome. Intraoperatively, the conditions can have similar presentations, but the management of each is markedly different. It is therefore important to try to identify the cause of iris prolapse. Although the loss of the red reflex is a feature associated primarily with suprachoroidal hemorrhage, the sign is not always present. Thus, the most definitive method of intraoperatively distinguishing between suprachoroidal hemorrhage and aqueous misdirection syndrome is to use indirect ophthalmoscopy or B-scan ultrasonography to assess for the presence of retinal elevation consistent with a suprachoroidal hemorrhage. My first step in managing the iris prolapse in this patient would be to perform indirect ophthalmoscopy to determine the likely cause of the increased posterior pressure.

The management of iris prolapse resulting from a suprachoroidal hemorrhage involves repositioning the iris and closing the incision. Cataract surgery can be completed at a later date. Closing an incision with entrapped iris tissue can be challenging, because the iris will not likely be easily repositioned. Typically, the chamber is very shallow, and it is tempting to try to reform it through the paracentesis with a cohesive OVD. In a firm eye, however, this maneuver will likely exacerbate the iris prolapse through the incision. It is better immediately to close the incision. A blunt second instrument may be used to displace the iris gently from one side of the incision toward its center. A 10–0 nylon suture could then be placed through the area of the incision free of iris tissue. This process could be repeated until a very narrow area of the incision remained unsecured. At this point, the iris could be repositioned with a small amount of cohesive viscoelastic applied through the incision or with a second instrument introduced through the paracentesis. With the iris out of the incision, the final suture could be passed. Even with small incisions, several sutures may be required to prevent recurrent prolapse. Once the wound is secure and the iris has been repositioned, the patient's IOP should be formally assessed and managed in the recovery area.

In cases of aqueous misdirection syndrome, the pressure rises because fluid passes behind the vitreous and becomes trapped. The vitreous is displaced forward, the chamber becomes shallow, and the eye becomes firm. A partial vitrectomy will allow the fluid to exit anteriorly and eliminate the posterior pressure. I would therefore perform a PPV to restore normal fluid dynamics to the anterior chamber. Once the chamber deepens, the cataract surgery can be completed. Miotics would minimize the risk of recurrent prolapse and round the pupil. It is important to note, however, that a PPV could complicate the hemorrhage and worsen the outcome if the patient has a suprachoroidal hemorrhage. For that reason, one must be relatively certain that the cause of iris prolapse is aqueous misdirection syndrome before performing a vitrectomy. ■

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