

# White Cataract and Capsular Rent

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## CASE PRESENTATION

A patient with a mature, white, intumescent cataract underwent cataract surgery using indocyanine green dye to stain the anterior capsulorhexis. Phacoemulsification was uneventful until a posterior capsular rent was noted (Figure 1). No vitreous prolapse was apparent. How would you proceed?



Figure 1. A dotted circle demarcates the posterior capsular rent.

## GUILLERMO ROCHA, MD, FRCSC

Ideally, irrigation should continue without aspiration (foot position 1) in order to maintain a positive pressure in the anterior chamber. After withdrawing the second instrument from the eye, the surgeon should inject a dispersive ophthalmic viscosurgical device (OVD) through the paracentesis, directly over the posterior capsular tear. The OVD injection should continue until the posterior and anterior chambers are filled. Once the eye is pressurized, irrigation through the phaco handpiece should be stopped, and the needle should be withdrawn from the eye. At this point, the OVD has three functions: (1) forming a plug to prevent vitreous prolapse; (2) forming a scaffold over which the remaining nuclear fragment rests; and

(3) protecting the endothelium during the intraocular events that will take place during the management of the complication.

Because the fragment is anterior to the iris, as the OVD pressurizes the globe, the surgeon could phacoemulsify the residual fragment under low-flow, slow-motion conditions. Alternatively, a Sheet's glide could be placed posterior to the fragment, thus securing it anteriorly for easier phacoemulsification and minimizing the risk of fragment migration into the vitreous cavity. Finally, if minimal or no cortical remnants are present, a foldable IOL could be inserted into the sulcus, thereby completely separating the anterior from the posterior chamber and creating a safe, stable place for phacoemulsification to take place under low-flow conditions.

Excessive flow may create pressure gradients that could compromise the stability of the posterior capsular tear. I routinely use bimanual I/A with a curved 23-gauge cannula. In this case, only the aspiration cannula would be used for a dry technique during which the residual cortical remnants could be gently engaged. I would inject an OVD as needed in order to maintain a pressurized globe.

Because the tear appears to be round and no vitreous seems to be present in the anterior chamber, an anterior vitrectomy would probably be unnecessary. Any distortions or opacities in the capsule could later be managed with a YAG laser. An alternative would be to make a small cut with intraocular scissors and create a larger posterior capsulorhexis, thus allowing later posterior capsular capture of the IOL.

My preference would be to place a three-piece foldable lens in the sulcus, and the intact anterior capsule would provide excellent support. In addition, I would attempt optic capture by the anterior capsulorhexis in order to improve stability of the lens and establish an appropriate anteroposterior position. I would remove the OVD from the eye under low-flow conditions and maintain eye pressure by injecting BSS through the paracentesis as the irrigating cannula was removed.

I would then constrict the pupil with intraocular acetylcholine in order to ensure the stability and positioning of

the IOL. A perfectly round pupil would reassure me that no vitreous strands were present. Finally, I would use a Meroceel surgical spear (Medtronic Ophthalmics, Jacksonville, FL) to dab the wound to ensure that no vitreous was present and the eye was adequately sealed.

### **LISA BROTHERS ARBISSER, MD**

Exchange the instrument in your nondominant hand for a Viscoat (Alcon Laboratories, Inc., Fort Worth, TX) cannula to fill the chamber before withdrawing the phaco tip. Once the chamber has stabilized, compartmentalize the residual fragment with Viscoat and keep it in the periphery, over the iris and away from the posterior capsular rent. Next, slowly push back the intact vitreous face by pressing a bubble of Viscoat through the capsular hole. With the microscope on high magnification, convert this hole to a continuous curvilinear capsulorhexis with Utrata forceps and use a centripetal vector of force to keep the capsulorhexis as small as possible.

Next, instill Miochol-E (Novartis Ophthalmics, Inc., Duluth, GA) to bring the pupil down and protect the capsular opening as well as to isolate it from the nuclear fragment. It will then be safe to complete phacoemulsification with low-flow parameters. Instilling 1:10,000 nonpreserved epinephrine (prepared with 1 mL of 1:1000 intracardiac epinephrine mixed with 9 mL of BSS) will redilate the pupil. Using a dry technique to manually remove the residual cortex via a cannula on a syringe rather than automated I/A will eliminate the risk of pressure variation or retrodirected fluid, which can encourage vitreous prolapse.

Place the lens in the bag (my choice would be the AcrySof Natural lens [Alcon Laboratories, Inc.]). If conversion of the posterior capsular rent is unsuccessful, place the haptics of a three-piece IOL in the sulcus and capture the optic through the anterior capsulorhexis. Again use Miochol-E to constrict the pupil and confirm that no vitreous prolapse has occurred. With the IOL tamponading the rent in the capsule, it is safe to use automated I/A to remove the OVD from the anterior chamber. Because residual viscoelastic will undoubtedly remain in the posterior chamber, prescribe oral acetazolamide for prophylaxis of postoperative ocular hypertension (assuming the patient does not have a documented sulfa allergy). Because this patient should have a fairly routine postoperative course, there is no need to alter your usual antibiotic prophylaxis or anti-inflammatory routine unless the vitreous face is disturbed.

### **IKE K. AHMED, MD, FRCSC**

Because only one nuclear fragment is present in this case and it is stabilized nicely by the iris and anterior capsule, I would avoid shallowing of the anterior chamber at all costs. While maintaining foot position 1 (irrigation only), I would

inject a dispersive viscoelastic to tamponade the capsular break, fill the capsular bag, and support the nuclear fragment. I would slowly decrease the bottle height until the OVD stabilized the chamber, and then I would pull the phaco tip out of the eye.

After enlarging the corneal incision by 0.5 mm, I would insert a phaco glide under the lens fragment, anterior to the iris, to act as a pseudoposterior capsule. Under low-flow conditions, I would then remove the entire nuclear fragment as a whole with the phaco tip. I would inject more dispersive viscoelastic as needed to maintain the anterior chamber in order to avoid fluctuations.

Once I had filled the capsular bag with a cohesive viscoelastic, I would remove the cortical material with a dry aspiration technique and a 27-gauge cannula. Because the rent seems small, I would place an in-the-bag, one-piece, open-haptic acrylic PCIOL (ie, the SA60 [Alcon Laboratories, Inc.]) with the haptics oriented at the 3- and 9-o'clock positions. I would be uncomfortable implanting any other PCIOL in the bag due to a concern that other materials or an open-haptic, three-piece design would unfold in an uncontrolled fashion and cause excessive tension on the capsule during implantation (resulting in an extension of the rent).

I find it unnecessary to convert such capsular tears into a posterior continuous curvilinear capsulorhexis (PCCC) when using the SA60 lens. Furthermore, such a conversion may be difficult and, if not completed successfully, may render the capsular bag unusable, even with this IOL.

I would evacuate the OVD from the anterior chamber, again using a dry aspiration technique with a 27-gauge cannula, and inject BSS. Because I would expect that the OVD might not be completely removed, I would prescribe Diamox (Wyeth Pharmaceuticals, Philadelphia, PA) 250 mg q.i.d. until I saw the patient later that day. As is my routine, I would also place Pilopine 4% gel (Alcon Laboratories, Inc.) in the inferior cul-de-sac at the conclusion of the case. I would constrict the pupil with Miochol-E in order to examine the eye for vitreous prolapse.

I would avoid wound hydration, which could cause a sudden increase or decrease of IOP that might extend the posterior capsular break. Instead, I would place a single 10–0 nylon radial suture to close the clear corneal wound.

### **WARREN E. HILL, MD, FACS**

I would immediately stop phacoemulsification and aspiration, but I would continue irrigation at a low bottle height until viscoelastic could be injected through the sideport to stabilize the posterior chamber. Only then would I remove the phaco instrument from the eye. At this point, I would also confirm that no vitreous had prolapsed through the capsular defect.

I would then insert a lens glide through a slightly enlarged

corneal wound and place it over the capsular defect and under the nuclear fragment. At this point, the fragment could be emulsified under low levels of fluid flow and aspiration, over the lens glide and away from the capsular defect. Before removing the lens guide and phaco handpiece from the eye, I would instill additional viscoelastic to maintain the stability of the posterior chamber.

The posterior capsular rent appears to be round and small. As long as the posterior chamber remained stable, the chances would be good that this defect would not widen. I would therefore remove the remaining lens cortex through a pair of paracenteses 180° apart with a bimanual technique under low fluid flow. Simultaneously, I would carefully monitor the area around the capsular defect for any signs of enlargement or vitreous engagement. After cortical removal, I would inject a small amount of washed Kenalog into the anterior chamber, as described by Burk and others,<sup>1</sup> to confirm that no vitreous had prolapsed through the posterior capsular defect. If any vitreous were “stained,” I would perform a two-port, watertight, Kenalog-assisted anterior vitrectomy through the two paracenteses. I have found the injection of washed Kenalog into the anterior chamber to be an indispensable part of managing posterior capsular defects.

If the defect did not grow, I would gently instill additional viscoelastic and place a SN60AT IOL (Alcon Laboratories, Inc.) into the capsular bag, with the optichaptic junction oriented along the 4- to 10-o’clock axis. A single-piece acrylic IOL would be especially well suited to this situation, because it unfolds very slowly, has excellent centration, and exerts only a minimal force on the region of the peripheral lens capsule. I would then remove the remaining viscoelastic under low fluid flow and place a single 10–0 nylon suture to ensure the integrity of the previously enlarged corneal incision.

### **ALAN N. CARLSON, MD**

Maintain chamber depth by resisting the temptation to immediately remove the phaco handpiece. Lower the bottle to reduce infusion turbulence and pressure gradients that affect anterior chamber stability. Make sure that the patient is not experiencing any discomfort, which might lead to eyelid squeezing. Also, ask the anesthetist for any evidence of patient discomfort such as hand squeezing, an elevated heart rate, or increased blood pressure. Ensure that the speculum’s position is not contributing to any posterior pressure. Changes in the red reflex may indicate posterior segment hemorrhage, another cause of increased posterior pressure.

While maintaining low-level infusion, remove the second instrument from the sideport incision and replace it with a viscoelastic syringe cannula for injection. Cohesive and dis-

persive viscoelastics each have specific advantages, but avoid delay by using whatever is already available for this case to establish a stable anterior chamber depth. The phaco handpiece may be removed once the anterior chamber is adequately protected with viscoelastic. Avoid overfilling the chamber with viscoelastic, because it can create an anterior pressure gradient and lead to capsular tear extension. If possible, create a small PCCC, which will reduce the risk of peripheral extension of the capsular tear. The goal is converting an open capsular bag into an intact capsular “tire.”

After PCCC creation, priority objectives include (1) preserving an intact anterior hyaloid face, (2) removing remaining lenticular material, and (3) making sure that no lens fragments fall posteriorly. A dispersive viscoelastic offers better retention with anterior hyaloid face protection in the presence of significant remaining lenticular material that requires phacoemulsification for removal. A second instrument through the sideport incision can be effective in reducing the risk of small lens fragments’ falling posteriorly.

After removing remaining lenticular material, inject viscoelastic to protect the anterior hyaloid face, which, ideally, is still intact. Expand the capsular tire with viscoelastic and maintain the anterior chamber depth. I favor a cohesive, easy-to-remove viscoelastic at this point.

I recommend using an indirect ophthalmoscope to look for any posterior segment pathology that might contraindicate an IOL during the primary procedure. The absence of such pathology coupled with the presence of an intact hyaloid face should allow in-the-bag insertion of a foldable IOL, preferably acrylic, because this lens material unfolds more slowly than silicone. If posterior capsular integrity and support seem to be inadequate, consider reducing the IOL power by 0.50 D, employing sulcus fixation of the IOL, and creating a peripheral iridectomy.

Viscoelastic removal in complicated cases is challenging; there is usually more present than usual, and the absence of an intact posterior capsule increases the risk for incomplete removal, vitreous prolapse, and IOL decentration and dislocation. Avoid high-flow irrigation during this step.

### **ROSA BRAGA-MELE, MEd, MD, FRCSC**

Most important is not to panic and withdraw one’s hands, which would cause a sudden decompression of the anterior chamber and possible extension of the rent, with vitreous coming forward and a loss of the piece of nuclear material. One should remain relatively stationary and use the phaco tip to stabilize or hold onto the nuclear material. One could then retract the second instrument and enter through the sideport opening with a dispersive viscoelastic such as Viscoat or Ocucoat (Bausch & Lomb, Rochester, NY). I would recommend covering the rent in the posterior capsule with the vis-

coelastic and push back the anterior hyaloid face. I would also recoat the endothelium with some viscoelastic, because I would likely remove the remaining piece of nuclear material in the iris plane or above in order to stay away from the posterior capsule. I would then keep the viscoelastic cannula positioned in the anterior chamber, either above the rent or below the nuclear fragment.

Next, I would use low-flow parameters to remove the piece of nuclear material. To decrease the amount of turbulence in the anterior chamber, one could lower the bottle's height and reduce the vacuum and aspiration flow rate. It would be important to remove the nuclear fragment without chopping or breaking it, which could result in multiple pieces flying around the anterior chamber. After turning the phaco needle so that the bevel was on its side, I would approach the piece of nucleus on a free edge and begin phacoemulsifying it, while carouseling it on the phaco tip. Power modulations would be advantageous. Using a burst modality with lower burst-width intervals or hyperpulse modalities would decrease repulsion of the nuclear material and increase followability, thereby allowing the piece to stay on the phaco tip for easier removal. I would concurrently inject viscoelastic at the site of the posterior capsular rent to keep it stable. After removing the remaining nucleus, I would stabilize the rent by gently filling the capsular bag with viscoelastic. I would then remove the phaco needle from the eye.

Before proceeding, I would inspect the capsular rent. If there were still no vitreous prolapse but the anterior hyaloid face were intact, I would convert the rent to a PCCC as described by Howard Gimbel, MD.<sup>2</sup> This maneuver would further stabilize the capsule and lessen the risk of propagating the rent. Before proceeding with I/A, I would cleave the cortex from the capsule with the viscoelastic in order to facilitate cortical removal. I would remove cortex under very low-flow parameters and would, in fact, split I/A using a bimanual technique. I would be sure to refill the defect in the posterior capsule periodically. If at any point vitreous were lost, I would perform an anterior vitrectomy with a bimanual technique.

Assuming no vitreous loss occurred and the rent's size remained the same, I would place a single-piece acrylic IOL in the bag by means of an injector system. If the rent had become larger than the anterior capsulorhexis or propagated to the periphery, I would use a three-piece IOL, open it inside the anterior chamber, and place the haptics in the sulcus and the optic in the bag. Then, I would remove the remaining viscoelastic, inject Miochol-E to ensure a round pupil, and verify that the wound was watertight at the end of the procedure. ■

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