Pop and Prechop: a Safer Cataract Technique for the Beginning Surgeon

This novel technique reduces complications by protecting the posterior capsule and minimizing phaco energy.

BY CHRISTOPHER E. STARR, MD

Today, advanced-technology IOLs are rapidly growing in popularity, and patients' expectations of cataract surgery are higher than ever. In my practice, I implant many of these lenses, but as director of both the residency program and cornea, cataract and refractive surgery fellowship at Weill Cornell Medical College, New York-Presbyterian Hospital in New York City, I am also responsible for teaching cataract surgery to trainees.

As patients' expectations, out-of-pocket expenses, and medicolegal liability have increased, it has become more and more difficult to find appropriate cases for trainee surgery. The published complication rates of capsular violation and vitreous loss for trainee-performed surgery ranges between 6% and 15%,[1,2] which is unacceptably high. The conundrum facing today's residency programs is how to ensure an adequate surgical experience for trainees while maximizing patients' outcomes, reducing complications, and meeting or exceeding patients' high expectations. It was with this challenge in mind that I developed the pop and prechop supracapsular phaco technique.

A MODIFIED SUPRACAPSULAR TECHNIQUE

Easier and Safer for Trainees

Pop and prechop is a modification of the pop and chop technique, which involves prolapsing or popping the lens out of the bag, engaging it en masse with the phaco handpiece, and dividing it using a traditional chopping maneuver at the iris plane.[3] In teaching pop and chop to residents, I noticed that they often had difficulty manipulating and engaging a large, unwieldy nucleus. The extra maneuvering led to wasted phaco energy, traumatized the corneal endothelium, and stressed the zonules. In many cases, the lens popped back into the bag. I devised pop and prechop to make this procedure easier, faster, and less complex for trainees.

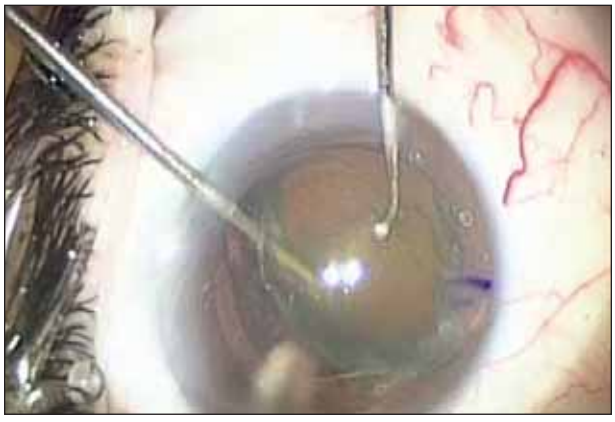

Figure 1. Any two instruments are used to prechop the lens.

No Phaco Energy Needed

As with pop and chop, the pop and prechop technique involves prolapsing or tilting the lens out of the capsular bag during hydrodissection. Then, instead of entering the eye with the phaco handpiece and using ultrasound to divide the lens, the surgeon prechops the lens mechanically using instruments routinely found on the cataract tray (Figure 1). I commonly employ a cyclodialysis spatula and either a Sinskey hook or a Connor wand ball-ended chopper, but any similar instruments will work. After popping the lens out of the bag, the surgeon introduces the first instrument (eg, the cyclodialysis spatula) through either a paracentesis or the main wound and positions it behind the lens. The chopper or Sinskey hook is then maneuvered through an opposite paracentesis or the main wound and placed in front of the lens.

Using a scissoring action, the surgeon can not only effectively and instantaneously divide the lens in half, but he or she can also break it into quadrants and even smaller pieces. As with other prechopping techniques, the lens

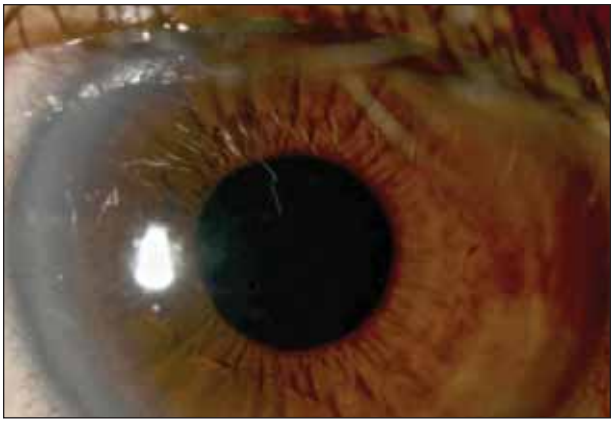

Figure 2. One day after surgery, the eye exhibits no corneal edema and has a visual acuity of 20/20.

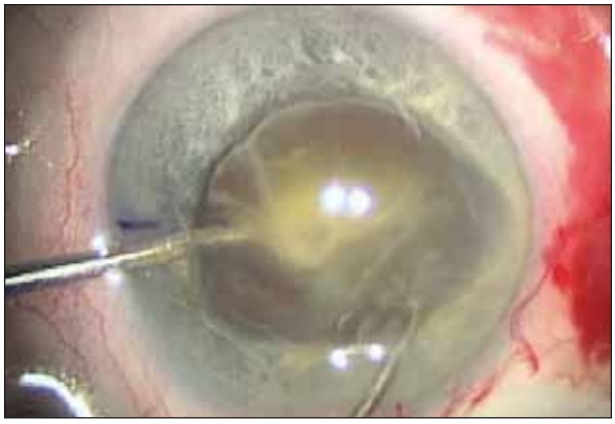

Figure 3. A prolapsed lens can "retract" a miotic pupil. This is a useful alternative to iris hooks and rings in cases of intraoperative floppy iris syndrome or pseudoexfoliation.

is divided into more manageable pieces without phaco energy. Unlike in these techniques, however, a major advantage of pop and prechop is that prechopping is performed safely away from the capsule and zonules without fear of chopping the bag. After dividing the lens, the surgeon can easily perform phacoemulsification at the iris plane or just above it, with little need for further manipulation or even chopping of the lens. This saves substantial time and phaco energy.

Protection of the Corneal Endothelium

Performing the key steps far away from the posterior capsule minimizes the risk of capsular tears. Because the technique is also performed closer to the cornea, however, does it cause more endothelial damage than in-the-bag techniques such as divide and conquer? My colleagues and I retrospectively evaluated the outcomes of 111 trainee-performed pop and prechop procedures and presented the data at the 2011 ARVO meeting.[4] On average, we found less endothelial cell loss at 1 month with the pop and prechop technique than with other in-the-bag techniques. The mean rate of endothelial cell loss at 1 month, as measured by confocal microscopy, was 6.9% (n = 20), which is 50% less than the reported rate at 1 month in trainee-performed divide and conquer (11.6%).[5] The former even compares favorably to the reported rates of modern surgery performed by veteran surgeons of 4% to 15%.[6-8] Corneal clarity scores (n = 111) were assessed using a scale of 0 to 4, and they were found to be, on average, 0.8 at 1 day, 0.15 at 1 week, and 0.005 at 1 month (only one patient with preoperative advanced Fuchs dystrophy had trace edema at 1 month). The significantly lower phaco energy and time needed with this technique are the reason for the low endothelial cell loss and low corneal edema scores (Figure 2). In our series, when compared with divide and conquer, the pop and prechop technique was associated with five times less cumulative dissipated energy and 50 times less phaco time. This dramatic conservation of energy undoubtedly helps to minimize corneal endothelial cell loss.

I have found that pop and prechop is a great technique for almost all patients. It is particularly advantageous in high myopes (it allows phacoemulsification to be performed more anteriorly), young patients (they have a healthier endothelium), and floppy iris cases (the fluidics remain above the iris and reduce billowing). It is also useful in pseudoexfoliation (working above the bag minimizes zonular stress), all small-pupil cases (the prolapsed lens acts as an iris retractor [Figure 3]), and even mature lenses (prechopping reduces phaco power and time [Figure 4]). For patients with a combination of Fuchs dystrophy, a dense lens, and a short eye and/or short anterior chamber depth, one is likely better off performing an in-the-bag technique.

The most noteworthy finding from our ARVO study was that, in the 111 trainee-performed procedures, the intraoperative complication rate was 0.9%. This rate is 10 times lower than the mean reported complication rate for trainee surgery of 10.5% (range, 6%-15%).[1-2] Pop and prechop, in this large series, handily accomplished its primary mission of reducing complications.

A SMALL LEARNING CURVE

Pop via Hydrodissection

Although the pop and prechop technique is easy to learn, prolapsing or popping the lens out of the bag with hydrodissection may be unfamiliar to some surgeons. A common misconception about supracapsular techniques is that an extra large capsulorhexis is needed to prolapse the lens out of the bag. This is not true. I recommend creating a well-centered capsulorhexis that is between 5.5 and 5.75 mm in diameter (Figure 5), which will let the lens easily pop out of the bag and will also allow adequate coverage of a typical IOL's 6-mm optic. If the capsulorhexis is particularly

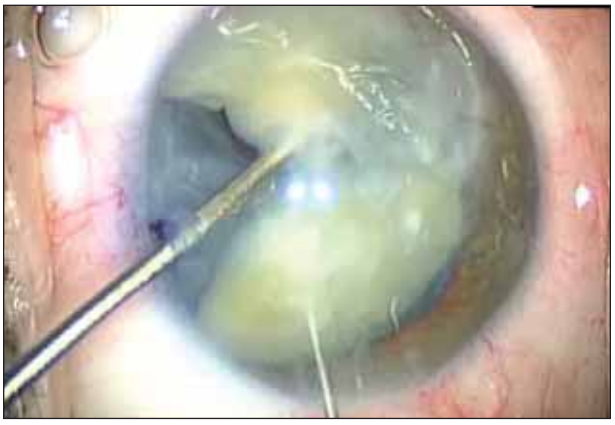

Figure 4. Pop and prechop reduces phaco time for dense lenses and protects the corneal endothelium.

Figure 5. A normally sized capsulorhexis of 5 to 5.75 mm is sufficient.

small (< 5 mm), which sometimes happens with tentative trainees, then an in-the-bag technique like divide and conquer would likely be a better approach. Often, the lens pops out of the bag at the completion of regular hydrodissection when the fluid wave reaches the other side. If it does not, I recommend continuing gentle hydrodissection while softly depressing the lens near the equator. With adequate downward pressure, the lens should easily pop out of the bag 180º away from the cannula.

Tips and Tricks: Viscoelastic Is a Friend

The strategic use of viscoelastic throughout the procedure can help minimize complications in trainee surgery. When I fill the anterior chamber with viscoelastic, I use a soft shell technique. With a dispersive viscoelastic, I coat the corneal endothelium, supported by a cohesive viscoelastic underneath (Figure 6). When training surgeons, I prefer to use Healon5 (Abbott Medical Optics Inc., Santa Ana, CA) during the creation of the capsulorhexis, because this ophthalmic viscosurgical device slows down the action and reduces radial tears by firmly tamponading the anterior capsule. Before popping out the lens with hydrodissection, I make space in the anterior chamber by first removing the cohesive viscoelastic via the main wound. After the lens has popped up, I instill more cohesive viscoelastic behind the lens to tamponade the posterior capsule during the prechopping and phaco maneuvers. I reinject a dispersive viscoelastic on the corneal endothelium in prolonged cases, for dense lenses, and in short eyes and/or the eyes of patients with Fuchs dystrophy. Although opening an extra vial or two of viscoelastic during a case is not cheap, it is worthwhile compared with the cost of a major surgical complication.

Another useful tip for improving the safety of trainee surgery is to use two paracenteses, located roughly 180º away from each other. This technique makes the scissoring prechop much more effective and controlled, and it minimizes

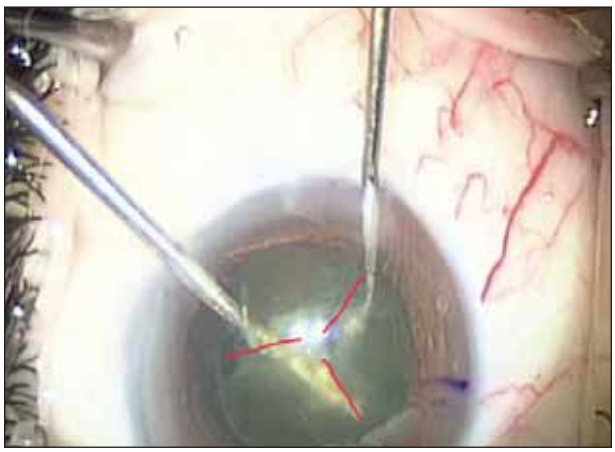

Figure 6. Viscoelastic behind and above the lens protects the bag and the cornea.

spinning of the nucleus, which could stress the zonules. It also facilitates the use of bimanual I/A, which makes removal of the subincisional cortex much easier for trainees. Two paracenteses 90º away from the main wound likely lead to a more astigmatically neutral cornea and allow the beginning surgeon to sit in his or her preferred and more comfortable position (usually temporally). Lastly, having a paracentesis easily accessible to the assisting attending surgeon is quite useful and minimizes the need to switch seats. It never ceases to amaze me how much of a case can be done through a single paracentesis. My final pearl for reducing complications in trainee-performed surgery is the use of continuous irrigation (he or she should engage it whenever in the eye).

CONCLUSION

Pop and prechop is an effective and safe alternative to in-the-bag techniques such as divide and conquer or stop and chop. Because the prechop is manual and supracapsular, pop and prechop combines the major advantages of both

prechopping techniques (less phaco energy and time) and supracapsular techniques (protection of the posterior capsule), and it minimizes their major disadvantages (endothelial cell loss). The pop and prechop technique has dramatically reduced the complication rate of trainee-performed surgery at my institution and has secondarily increased the number of appropriate trainee cases. Due to its increased safety, simplicity, and speed, pop and prechop has become my preferred technique for nontrainee cases as well. ■

To see a demonstration of the pop and prechop technique, visit http://eyetube.net/?v=zebul.

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Ophthalmic Video Resource

Christopher E. Starr, MD, is an assistant professor of ophthalmology at Weill Cornell Medical College in New York and is the director of the refractive surgery service, director of the residency program, and director of the cornea, cataract, and refractive surgery fellowship. He acknowledged no financial interest in his technique or any products mentioned herein. Dr. Starr may be reached at cestarr@med.cornell.edu.

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