Educating Cataract Surgeons: a Glimpse of the Future

From video cases to three-dimensional surgical simulators, the author has seen—and has been responsible for—changes in teaching techniques.

BY ROBERT H. OSHER, MD

I have enjoyed teaching cataract surgery for 3 decades, but I consider myself one of a dying breed. When I trained at the Bascom Palmer Eye Institute in Miami and at the Wills Eye Hospital in Philadelphia, my fellow students and I learned to operate by reading the literature, watching an occasional movie of a perfect procedure, and assisting the resident in the class ahead of ours. We would occasionally attend a conference or read an outdated chapter in a textbook. When a complication occurred (and it did plenty of times), we would have very little idea of why it happened. "Watch one, do one, and teach one" was the accepted sequence, and we sharpened our skills either at the VA hospital or at some foreign destination.

BEGINNING THE VIDEO JOURNAL

In 1983, I was on a plane between Oklahoma City, where I had just watched Jim Little, MD, perform surgery, and Newport Beach, California, where I was going to observe Richard Kratz, MD. It was then that the truth hit me that cataract surgery was very difficult to learn. Surgeons in private practice would spend a lot of money to visit a recognized leader, but a rash of cancellations, a dysfunctional machine, or a missed airline connection could result in disappointment. It was in this setting that I founded the *Video Journal of Cataract and Refractive Surgery*. It made so much sense to me to invite leading surgeons from around the world to submit a recording of their operation. I would then edit and produce a 1-hour video program that could be viewed and studied in the comfort and convenience of one's own home.

At about the same time, I realized that every surgeon showed only his or her most perfect case. Never did I see a single complication at a conference, yet it seemed like I could not perform a perfect operation myself. The value of these presentations was therefore somewhat limited. In the early 1980s, I introduced the first Video Symposium of Complication Management and, a few years later, the Video Symposium of Challenging Cases. I was quite sure that, by viewing my intraoperative problems, surgeons would gain invaluable knowledge that would help them whenever they encountered a complication of their own. Before long, I was traveling more than 100,000 miles a year spreading the gospel.

NEW ERA OF LEARNING

Fortunately, young surgeons and the teachers of tomorrow are entering a new era of education. Although print journals, textbooks, and meetings will still exist, novel technology will largely supplant these sources, much as the Internet has replaced audiotapes, CDs, and DVDs for the *Video Journal*. Trainees who wish to watch any procedure will need travel no farther than

their fingertips … fingertips that will already be incredibly dexterous from hours of texting and playing computer games. Trying to understand a procedure by following the diagrams on the printed page will be replaced by viewing actual surgical images in three dimensions. For the past several months, I have been teaching cataract surgery to the residents at the University of Cincinnati using the TrueVision 3D system (TrueVision Systems, Inc., Santa Barbara, CA), which offers an unparalleled learning experience. Surgical simulators, although very expensive, will save countless dollars and eyes by avoiding the perils of trial by fire.

There will also be a downside. Until the government realizes that a surgeon will not sell his soul for an ink pen or a dinner, teachers will be restricted by the new continuing medical education guidelines. The pendulum of reason will eventually swing back, but in the meantime, I believe the quality of education will be compromised. It is this observation that has compelled me to organize a new course, "Cataract Surgery: Telling It Like It Is!" I am just too old to be told that I cannot mention the virtues of a specific product or the precautions necessary when using a new device that must be named.

CONCLUSION

I am a bit of a dinosaur. The way that I learned cataract surgery will never be repeated, which is fortunate. Exciting new technologies await the youth of today, and it will not be long before femtosecond cataract surgery, incredible IOLs, and new drug delivery systems become commonplace. The teacher of tomorrow will not have to fight security lines at the airport, be away from his or her practice, or miss his or her son's or daughter's basketball game. If surgeons can either outwit or outlast the government's intrusion, both the teaching and the performance of cataract surgery are going to be exhilarating! ■

Teaching Cataract Surgery: 10 Lessons

Robert H. Osher, MD, shares his answers to the most commonly asked questions.

I have devoted a career to teaching cataract surgery, often traveling more than 100,000 miles in a given year. Regardless of whether I am speaking to residents or experienced surgeons, I hear recurrent questions that relate to each step of the contemporary procedure. Here are the most frequently asked questions and my responses.

THE INCISION

1. In transitioning to a smaller incision, is it more difficult to maneuver the ultrasound and the I/A tip? Do you have any suggestions?

The smaller incision notoriously results in "oar-locking." When one watches a surgical video where the surgeon is advancing the tip forward, the eye will usually move as a result of the increased friction within the small incision. It is also more difficult to "fulcrum" the tip within the incision, which frequently limits the range of access to cortex. The solution involves creating an internal flare during the incision's construction. For example, an incision may have a 2.2-mm external width and a 2.4-mm internal width. This incision is easy to perform (Figure 1).

HYDRODISSECTION?

2. Are there situations where routine hydrodissection is contraindicated?

There are several situations in which I would avoid hydrodissection. A fluid wave can blow out the posterior capsule when it is either unusually thin or partially absent in the case of a posterior polar cataract or in the presence of a previous opening, for example, due to penetrating trauma or after previous vitrectomy. Abhay Vasavada, MD, from India has developed the inside- out delineation technique, which effectively delaminates and frees the nucleus for emulsification.[1] The mature brunescent cataract is also challenging because a fluid wave may be unable to escape, thereby putting the posterior capsule at risk. The intumescent white cataract in a younger patient is also risky, because a fluid wave may result in the Argentinean flag sign. In the last case, Carlos Figueiredo, MD, from Brazil has shown that an intralenticular nuclear block occurs with elevation of the pressure in the posterior cortical compartment.[2] He has recommended posterior voiding (depressing the nucleus) to decompress the posterior compartment prior to unrestricted hydrodissection.

PHACOEMULSIFICATION

3. Does torsional ultrasound present a greater risk to the anterior capsule?

After hearing this question and not knowing the answer, I performed a number of torsional phacoemulsifications in the laboratory using cadaver and porcine eyes. I found that the anterior capsule could be damaged with high power, a sharp tip, and inappropriate technique using either torsional or longitudinal ultrasound. Traditional longitudinal ultrasound could rupture the anterior capsule if the tip was occluded using high vacuum and moderate power. The anterior rim could be cut more easily with torsional ultrasound when unoccluded if the bevel was allowed to oscillate perpendicular rather than parallel to the rim. I have found that torsional ultrasound reduces repulsion and is a more efficient cutting technology. Either modality can cause trouble if a suboptimal technique is employed.

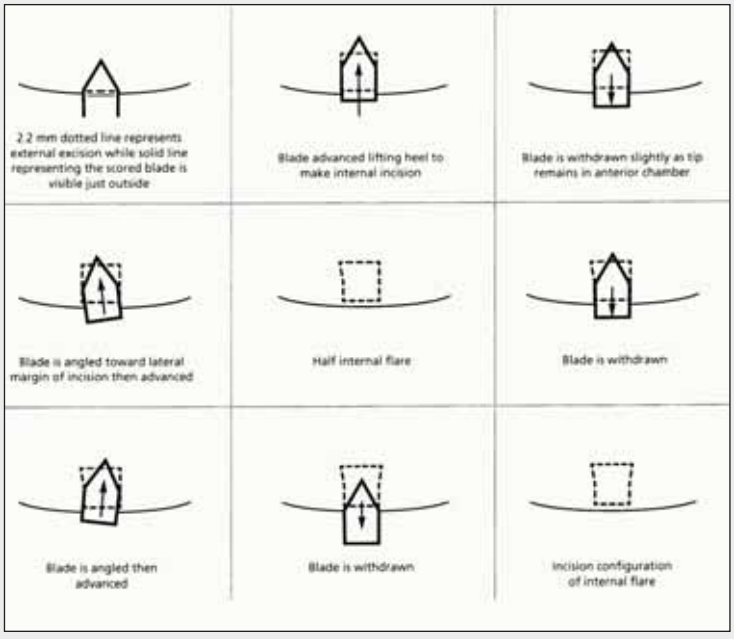

Figure 1. Creating the cataract incision.

4. How can the surgeon offer the best possible protection to the posterior capsule during phacoemulsification?

First and foremost, the surgeon must balance the fluidics to achieve a stable chamber. Equally important is the requirement that phacoemulsification be performed in the deepest and most central location. Two important concepts are less appreciated. With a softer nucleus, excessive vacuum during the creation of a groove or trough may cause sudden penetration of the phaco tip through the lens if the tip is inadvertently occluded. As the tip descends through the nucleus during sculpting, the surgeon should reduce the vacuum considerably, because a higher vacuum is unnecessary during sculpting. Moreover, an inadvertent break in occlusion will not suddenly puncture the lens. With respect to harder nuclei, the phaco tip should be placed next to the bank of an adjacent nuclear hemisphere or quadrant, which holds back the posterior capsule. This protection vanishes during phacoemulsification of the last quadrant, so a second, blunt instrument should be placed behind the quadrant to physically prevent "trampolining" of the posterior capsule.

CORTICAL REMOVAL

5. Do you have any tricks for making it easier to remove the subincisional cortex?

Certainly, bimanual I/A makes this a moot question. However, the surgeon who prefers coaxial I/A is best served by always removing the subincisional cortex first. Taking the easy option and removing subincisional cortex last allows the capsular bag to close before the most difficult cortex is removed. By removing the subincisional cortex first, the rest of the cortex acts to hold the bag open, analogous to a shoe tree. Regardless of the configuration of the I/A tip, it is easier to remove the subincisional cortex when the bag is formed rather than collapsed, an advantage of aspirating it first.

MANAGING THE CAPSULE

6. Do you see any role for vacuuming the anterior capsule?

Absolutely. I learned from Richard Mackool, MD, that the distal half of the anterior capsular rim should be vacuumed when the patient selects a premium multifocal IOL. Dr. Mackool's rationale is that the patient is paying to attain emmetropia, and if an unintended residual refractive error is present, interrupting the fibrinectin response delays the bioadhesion between the anterior capsule and the IOL. Therefore, reopening the capsular bag for a lens exchange is easier to accomplish. I have also added this step to any case in which I am less confident about the IOL selection (high myopes, high hyperopes, and in cataract types where biometry is either variable or not possible).

7. The most common significant complication that is encountered remains the torn posterior capsule. Do you have a tip for reducing its incidence?

The best that I can recommend is not a brilliant tip but rather a soft tip! In other words, the greatest single advance in posterior capsular protection has been the soft I/A tip. A laboratory study performed by William Gates, MD, demonstrated that, when metal comes into contact with the posterior capsule, a tear can occur with vacuum levels as low as 15 mm Hg.[3] By contrast, the silicone tip does not rupture the capsule when the vacuum level exceeds 500 mm Hg. The difference can be explained by examining different tips using scanning electron microscopy. The lumen of the metal tip looks like a shark's mouth, and multiple sharp edges are commonly present. The lumen of the silicone tip appears perfectly smooth. Every so often during cortical removal, my silicone I/A tip engages the posterior capsule, which does not tear. I absolutely recommend soft I/A tips for maximal protection to the posterior capsule.

THE IOL

8. A great deal has been made of aligning a multifocal lens with the optical axis, the visual axis, or the geometric center of the cornea. Do you have a preference?

I prefer to avoid this debate and instead recommend constricting the pupil at the end of the operation with Miochol-E (Novartis Pharmaceuticals Corporation). Then, I tilt the patient's head slightly so that the plane of the pupil is perpendicular to my coaxial view through the microscope. When I center the concentric rings of the single-piece multifocal lens within a small pupil, I feel confident that the lens will appear centered on the first postoperative day. I routinely give a drop of weak pilocarpine at the end of surgery, and I observe consistent centration of the rings within the undilated pupil on the day following surgery.

9. You have been an outspoken critic of the common method of aligning toric lenses using ink marking pens. What is your preferred approach?

I believe that toric lenses will soon become the standard of care, and virtually every ophthalmic device manufacturer is developing a toric IOL. Alignment is critical, and every degree of error results in a 3.3% reduction in the amount of cylinder that can be corrected. Ink marks represent approximations, and independent studies performed by Rudi Nujits, MD, of Belgium and my own team show an average error of 7º with some frightening outliers. The ink commonly diffuses, and in some cases, the mark disappears entirely.

I have introduced the concept of iris fingerprinting, whereby a high-resolution photograph is taken during the initial examination when the pupil is dilated. This image is captured, and software automatically places the horizontal and vertical meridia as well as provides the exact number of degrees corresponding to any specific landmark (crypt, nevus, stromal pattern, Brushfield spot, etc.). In the OR, it is very easy to establish these identifying meridia from the image and then to accurately locate the target axis for alignment of the toric lens. I have used several methods of iris registration, which are also highly effective. The jury is still out regarding the accuracy of intraoperative wavefront aberrometry.

THE VISCOELASTIC'S REMOVAL AND THE INCISION'S CLOSURE

10. Occasionally, the anterior chamber will either be shallow or collapse after the ophthalmic viscosurgical device is removed at the end of the procedure. Can this be avoided?

Collapse of the anterior chamber at the end of surgery may occur for several reasons: scleral collapse in a young patient or a high myope, fluid misdirection through zonules that increases vitreous pressure, indentation of the globe by the lids or the speculum, choroidal effusion from hypotony, or any cause of an intraoperative Valsalva maneuver, just to name a few. Shallowing or collapse of the chamber may result in rotation of a toric lens, decentration of a multifocal IOL, unplanned optic capture, or in the worst case, contact between the implant and the corneal endothelium. A simple change in the sequence of steps will reduce the surgeon's vulnerability. I recommend hydrating the incision prior to removing the ophthalmic viscosurgical device. Therefore, when the I/A tip is withdrawn, the hydrated incision will be less likely to leak, and the chamber will be more stable.

It is surprising how often these questions are raised by cataract surgeons with varying levels of experience. I hope that some of these answers will be helpful to readers. ■

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1. Vasavada A. The inside-out delineation technique [videotape]. *Video Journal of Cataract and Refractive Surgery*. 2007;23(1).
2. Figueiredo C. Getting rid of the Argentine flag [videotape]. *Video Journal of Cataract and Refractive Surgery*. 2005;21(4).
3. Gates W. Avoiding posterior capsule tears with low vacuum levels [videotape]. *Video Journal of Cataract and Refractive Surgery*. 2002;18(1).