Strategies for Creating a Model Capsulorrhexis

Proper instrumentation can be just as important as surgical technique.

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JORGE L. ALIÓ, MD, PhD
I use the Alió Capsulorrhexis Forceps (Katena Products) to create a capsulorrhexis of about 4.9 to 5 mm in diameter, well centered on the pupil.

I am satisfied with the results of my current technique; however, an alternative would be to use a femtosecond laser for capsulorrhexis creation as well as other steps of the procedure. I used the LenSx femtosecond laser (Alcon) until recently, and for me the postoperative outcomes were the same as with manual techniques.1 It is true that the laser-assisted capsulorrhexis is perfect and performed under more control. But I was less satisfied with the laser’s corneal incisions, which in about 10% of my cases were leaky, and nuclear fragmentation in anything more than cataract grades 2 to 3 was poor. I temporarily abandoned use of the femtosecond laser for cataract surgery because the economic burden is too heavy for my patients. Simply speaking, they cannot pay a fee of €800 or more per eye just for the sake of forming the capsulorrhexis with a femtosecond laser, with no relevant benefits to report to the patient.


ROBERTO BELLUCCI, MD
The first step for a perfect capsulorrhexis is choosing the perfect forceps. Because more than 20 cataract surgeries are performed daily in my department, we decided to switch to single-use forceps, which are now included in our custom packs for cataract surgery. Our single-use forceps fit through 1.8-mm incisions, are uniform in quality, and always work in the same way.

Several single-use models are available. The thin teeth of the Moria forceps easily break the anterior capsule, but it is sometimes difficult to grasp and pull the capsule to correct a rhesis escape. The gentle teeth of the BD forceps (Beaver-Visitec International) allow easier handling of the capsule, but a cystotome may be required to break an elastic capsule.

I usually break the capsule from the center to the right in order to lift the inferior capsule lid; thus, counterclockwise capsulorrhexis construction is required. I always tell my trainees that the direction of the tear is indicated by the first break, not left to our choice. I also tell them to grasp the capsule a limited number of times, usually three. Every time the capsule is released and regraped, a potential source of error is introduced.

The direction of the tear is a function of the distance between the forceps and the tear itself, and this must be taken into account to avoid crescents. Additionally, a shorter distance allows better control but is more sensitive to even the smallest movements of the eye.

BJÖRN JOHANSSON, MD, PhD
The entrance of femtosecond laser technology into the cataract surgery space allows surgeons to enhance
the precision and reproducibility of their anterior capsulotomy. However, it is necessary to clarify why manual creation of a continuous curvilinear capsulotomy (CCC) still has a place in modern cataract surgery.

Apart from obvious economic advantages, the edge of the torn capsular opening is smoother and, thus, more mechanically stable than one cut by a laser. The claimed advantages of femtosecond technology—improving the accuracy and predictability of refractive targeting—must be further explored, especially with respect to the clinical significance of demonstrated results. In short, can the patient perceive any improvement in visual quality when a femtosecond laser is used for the CCC?

For the best control and flexibility throughout the procedure and within the limited space of a shallow anterior chamber, I use microforceps to create the capsulorrhexis. This gives me better control over the tear, especially in hyperopic eyes with a convex anterior lens surface. Ideally I create the rhexis in three steps, which are demonstrated in an Eyetube video (eyetube.net/?v=ejofe).

**Step No. 1.** The lens capsule is initially punctured with one jaw of the forceps (Figure 1A), the capsule is grasped, and the tear is initiated with a narrow flap directed toward the periphery (Figure 1B).

**Step No. 2.** Once the tear reaches the desired distance from the center, corresponding to a rhexis diameter of approximately 5 to 5.5 mm, the narrow flap is turned from a radial to a tangential direction (Figure 1C). Thus, a broader flap is created, and it is then regrasped for continuation of the tear to approximately two-thirds of the circumference.

**Step No. 3.** The flap is regrasped again (Figure 1D), about 0.5 to 1 mm from the tear, to complete the rhexis (Figure 1E).

In my opinion, the only way to obtain a perfect capsulorrhexis is with the femtosecond laser.

**SIMONETTA MORSELLI, MD**

In my opinion, the only way to obtain a perfect capsulorrhexis is with the femtosecond laser. When I do not use the laser, I create the initial opening in the anterior capsule at its center (Figure 2) with sharp capsulorrhexis forceps. I make a notch on the
surface and use calibrated forceps to ensure that I obtain the correct diameter.

THOMAS F. NEUHANN, MD

My standard capsulorrhexis technique has not changed since I first described it almost 30 years ago. I use a 23-gauge bent needle on an irrigating handpiece through a paracentesis incision. I puncture the capsule centrally and slit it toward the periphery in a curved shape to the desired circumference. I fold it over onto itself, engage it with the needle tip on its back surface, and tear it circumferentially to create a 5-mm diameter opening. I regrasp the tear about four or five times in order to always have direct control on the tear vectors, eventually closing the circle from the outside to the inside.

I use trypan blue dye whenever visibility is or may become impaired intraoperatively; I tend to err on the side of generous indications. Additionally, I use a high-viscosity ophthalmic viscosurgical device (OVD) in all intumescent cataracts and whenever my standard technique under irrigation does not provide full control of the procedure, for whatever reason. Here, too, I tend to err on the safe side.

With OVD, I usually prefer to use the forceps through the paracentesis placed over the needle and guided by the tube.

As a basic rule, the capsulorrhexis should not be viewed as a defined technical procedure but rather understood as a principle, the realization of which is possible in a multitude of technical ways. Every surgeon must find the way(s) that suit his or her hands best under given circumstances.

As a final note on this topic, with regard to emerging femtosecond laser technologies: The femtosecond laser does not—and cannot—cut the capsule with a continuous edge like the rhexis does by default. Rather, the laser performs a can-opener capsulotomy. The discussion of whether and how much that matters and whether there are advantages that counterbalance the expense and other factors is ongoing however, in my opinion there is a major advantage to the continuous anterior capsular margin, which can be achieved only with a manual rhexis and not with a femtosecond laser. The scientific validity and weight of what has been published to the contrary has not yet convinced me differently. I am, of course, highly curious and actively interested in this ongoing development, but I allow myself the luxury to be less interested in marketing ballyhoo and laser beam witchcraft than in real progress of our art.

TOBIAS H. NEUHANN, MD

A perfect, centered anterior capsular opening that is consistently reproducible and always measurable in size can only be achieved mechanically. Currently, femtosecond lasers by any manufacturer can achieve much better results than the human hand. Although only time will tell what size is most suitable, one thing is already clear: The capsulorrhexis, or the new femtotorhexis, should always be smaller than the implanted IOL in order to minimize tilt and to ensure the dependability of the applied lens power calculation.

Only once the entire IOL edge is covered by the anterior capsule can the posterior IOL edge have the optimal effect in postponing formation of posterior capsular opacification for as long as possible. For a 6-mm IOL, a 5-mm capsular opening is generally recommended. This means that an overlap of only 0.5 mm is available around the IOL-rhexis border. In many cases, this is simply not enough.

Because the capsular bag does not have a predictable size or shape and is by no means circular, I try to make the capsulorrhexis much smaller (4 to 4.5 mm) so that the capsule overlap is about 1 mm.

This, in turn, leads to new problems, however. Phacoemulsification becomes more difficult, radial tears and their attendant problems easily develop, and capsular phimosis or capsular contraction syndrome also readily emerges. It is mandatory, therefore, to polish the anterior capsular membrane. This can be achieved properly only with a bimanual I/A system. Future studies will reveal which size of capsulorrhexis is ideal, and substantial changes to IOL designs are certain to follow.

KHIUN F. TJIA, MD

After entering the anterior chamber with the non-cutting side of my phaco knife, I advance the knife in a slightly oblique direction and make a cut in the anterior
lens capsule. I can then grasp the anterior capsule easily with Inamura-style cross-action capsulorrhexis forceps.

I do not have a specific technique for capsulorrhexis formation, other than leaving the capsular edge in a position that allows it to be easily regrasped before opening the forceps. In the near future, I anticipate using the Verion Image-Guided System (Alcon) to project the proposed shape of the CCC through the microscope. This should greatly facilitate creating a consistent capsulorrhexis size.

**ABHAY R. VASAVADA, MS, FRCS**

I prefer to create the CCC under a high-viscosity cohesive OVD such as a Provisc (Alcon). To create the CCC, I fashion a cystotome by bending a 27-gauge cannula at two points, distal and proximal. I titrate the proximal bend, which acts as a hinge at the incision, depending on the anterior chamber depth. For the typical myopic eye with a deep anterior chamber, the bend has an obtuse angle; in an eye with a shallow anterior chamber, the bend is more acute. To avoid cutting the roof of the incision, the cystotome enters the eye so that its sharp end faces the incision laterally. Once it reaches the center of the eye, the cystotome is rotated so that the sharp end faces posteriorly.

A nick is made in the anterior capsule by initiating a puncture just off-center. In a single motion, the tear is moved laterally until a point midway between the center of the eye and the pupil margin. To create a clockwise CCC, the cystotome pushes the nick close to the lateral point to lift the flap. From then on, the cystotome engages the flap close to its edge.

Each stroke is made parallel to the edge of the pupil. If the distance between the pupil and the emerging flap decreases, I stop and exit the eye. I inject OVD anterior to the site of the flap that is going peripheral, inflate the anterior chamber with OVD, and restart.

Typically, as I approach the subincisional area, the flap has a tendency to float out. To prevent this, I keep the loose flap on the central bare area to reduce the possibility of a peripheral rhexis extension. Having travelled circumferentially, the end of the flap is made to overtake the initial point, thus avoiding leaving a weak area on the CCC.

In case of a suspicious weak area, I try to confirm the integrity by lifting the edges with a Lester hook introduced through the paracentesis. Typically I fashion a CCC that is centered, small, and with a continuous edge that uniformly covers the peripheral optic circumferentially.