My MICS Technique

Minimizing incision size has been a fundamental step in the evolution of cataract surgery.

BY ALESSANDRO FRANCHINI, MD

In recent years, we have witnessed a rapid and striking technological evolution that has increased the expectations of our cataract patients. Today, it is no longer sufficient to guarantee patients good visual acuity for distance. In fact, the majority of patients no longer want to have good spectacle-free visual acuity at all distances but, paradoxically, desire the vision of younger individuals who do not yet need cataract surgery. It is for these reasons that we have introduced the concept of refractive cataract surgery.

Since 1970, with the development of ultrasonic phacoemulsification, the dream of ophthalmologists has been to perform cataract extraction through a 1.0-mm incision and then to refill the capsular bag with an injectable lens to maintain accommodation. Toward the end of this past century, to achieve this goal, numerous energy sources were tried, including various lasers with different wavelengths and waterjet technology. However, these attempts failed because, even if the energy sources were cooler and safer than ultrasound, they were less efficient and often unable to manage hard nuclei.

At the beginning of this century, with the introduction of ultrapulse technology by Abbott Medical Optics Inc., it became possible to perform a sleeveless phacoemulsification technique using ultrasound. Furthermore, over the past few years, the introduction of Micro and Nano Sleeves (Alcon) has given us the ability to perform coaxial phacoemulsification through an incision of 1.8 to 2.0 mm.

Minimizing incision size has been a fundamental step in the natural evolution of cataract surgery. Smaller incisions allow us to reduce surgical trauma and complications, decrease the possibility of infection, maximize visual outcomes, and speed visual recovery. In the near future, cataract surgeons who do not perform microincision cataract surgery (MICS) may face problems in trying to satisfy their patients’ wishes. In fact, to avoid surgically induced astigmatism, MICS became essential from the moment presbyopia-correcting and toric IOLs gained widespread acceptance.

SURGICAL TECHNIQUE

Although in past decades I believed that bimanual phacoemulsification represented one of the most important innovations in cataract surgery, I have stopped performing it in routine cases. Instead, I reserve the use of bimanual phacoemulsification for selected cases only.

My current standard practice is microcoaxial phacoemulsification (C-MICS). This procedure combines the principles of coaxial surgery with those of bimanual microphacoemulsification (B-MICS) to yield a technique that is simple to perform in standard cases, has no significant learning curve, and is associated with fewer complications.

With my C-MICS approach, surgery is performed under topical anesthesia. After creating a preincision at the 10-o’clock position with a 15° steel blade, I perform a 2.2-mm square clear corneal tunnel using a precalibrated steel knife, trying to create three planes to ensure a watertight incision postoperatively. Next, two sideport incisions are created at the 9- and 2-o’clock positions.

After refilling the anterior chamber with a viscoadaptive ophthalmic viscosurgical device (OVD; Viscoat [Alcon] or Healon 5 [Abbott Medical Optics Inc.]), I perform a 5.5-mm capsulorrhexis using suitable 23-gauge forceps. It is particularly important that the capsulorrhexis be perfectly centered and round. A well-centered capsulorrhexis with 360° overlap of the IOL optic is fundamental with the use of premium IOLs. Perfect centration of the IOL is key in being able to take advantage of the particular features of each lens and in preventing the induction of higher-order aberrations and dysphotopsia.

I pay particular attention during hydrodissection and hydrodelineation, which, in my opinion, are fundamental steps to facilitate all further maneuvers and to avoid complications. If rotation does not occur, or if the nucleus is not well separated from the cortical material, these steps must be repeated.

PHACO APPROACH, SETTINGS

My choice of phaco-chop approach and phaco system settings depends on the hardness of the nucleus, as detailed below.

Hard nuclei. In the case of a hard or very hard nucleus, I prefer to perform a stop-and-chop technique. After sculpting a central groove—which must be very deep in the case of brunescent cataract—I crack the nucleus by opposing the chopper and the phaco needle. Then, the phaco needle engages the two epinuclei, which are cut by the chopper into three or four pieces and aspirated.
Medium-hard nuclei. For a medium-hard nucleus, I believe that the quick-chop technique is the most suitable. After aspirating the anterior soft epinucleus, I impale the nucleus with the phaco tip. High vacuum immobilizes the nucleus, which is then chopped with a vertical chopper. The nucleus is divided into two parts, then each half is divided into three or four pieces, emulsified, and aspirated.

Soft nuclei. Normally, in soft nuclei, it is difficult to perform either the stop-and-chop or quick-chop technique. Therefore, in these patients, I believe that the best technique is phaco aspiration with a small amount of torsional ultrasound with the Ozil handpiece (Alcon) if needed.

For the cortex removal phase, I prefer to use a bimanual I/A approach, with continuous infusion mode to avoid anterior chamber collapse. The irrigation flow can be used like a surgical tool to direct cortical material and fragments toward the aspiration cannula. Furthermore, it is possible to flush fragments from the angle or to remove them when they remain beneath the incision and to avoid anterior chamber collapse that can occur when the tip of a monomodal I/A probe is pulled back to the incision site.

Finally, I implant the IOL and finish with delicate hydration of the main incision and the two paracentesis incisions. To prevent extreme hydration, it is important to avoid misalignment of the incision borders, which can produce the so-called postcataract surgery discomfort syndrome.

Until last year, I preferred the safety of a peristaltic pump, but today, thanks to recent technological innovations, I prefer the efficiency of a venturi pump in some surgical phases. On one hand, lower vacuum settings are possible because of the introduction of torsional and transversal (Ellips; Abbott Medical Optics Inc.) ultrasound modalities, with lower repulsive forces compared with longitudinal phacoemulsification; on the other hand, higher vacuum settings can be used safely when needed because of the reduction in postocclusion surge due to microprocessors that sense and correct the anterior chamber pressure.

Each pump is particularly suitable for specific phases of the cataract procedure.

**TAKE-HOME MESSAGE**

- B-MICS and C-MICS are worthy and innovative techniques that should be part of every good anterior segment surgeon’s working experience.
- C-MICS combines the principles of coaxial surgery with those of bimanual microphacoemulsification to yield a technique that is simple to perform in standard cases and associated with few complications.
- According to the individual features of the peristaltic and venturi pumps, each pump is particularly suitable for specific phases of the cataract procedure.
the cataract procedure (Figures 1 through 4). During nucleus fracture, I prefer a peristaltic pump for the highest control, and during nucleus emulsification I use a venturi pump for its efficiency. However, if the nucleus is very hard, a peristaltic pump guarantees the highest degree of holdability. During epinucleus removal, I prefer the control of the peristaltic pump, and, finally, during cortex and OVD removal, the speed of the venturi pump is most useful. With the WhiteStar Signature platform (Abbott Medical Optics Inc.), it is possible to work with a peristaltic and a venturi pump simultaneously with the same cassette, enabling the surgeon to switch from one to the other directly on the fly.

Presently, I reserve B-MICS for selected cases only: for example, in patients with small pupils or a floppy iris that moves during aspiration, presenting a risk of nicking the pupil margin. By directing the irrigation flow at the iris, the surgeon can hold the floppy iris in place. In patients with limited zonular dialysis, the use of an open-ended irrigating chopper presents many advantages. Pointing the irrigation flow inside the bag in the direction of the dialysis, it is possible to maintain the bag in position and perform maneuvers with greater safety; it is also possible to avoid the risks of fluid misdirection syndrome, in which passage of liquid into the retrolichteral space causes forward movement of the iris-lenticular diaphragm and a dramatic increase in tension, or passage of liquid into the posterior chamber results in vitreous prolapse.

CONCLUSION

In my opinion, B-MICS and C-MICS are both worthy and innovative techniques that should be part of every good anterior segment surgeon’s working experience.

In the 1970s, when Charles Kelman, MD, introduced ultrasonic phacoemulsification, he was obliged to propose a coaxial design because the temperature of the ultrasonic tip was high. However, if Dr. Kelman had today’s so-called cold ultrasound, I think that he would have introduced a bimanual technique and never would have thought of putting a sleeve over the tip. If he had proposed a bimanual technique, it is likely that no one after him would have thought of proposing coaxial phacoemulsification. In essence, the main reason many of us today prefer the coaxial approach is probably that we have been performing phacoemulsification this way for 30 years.

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