

Microincisional Phacoemulsification

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Phaco surgeons are continuously striving to remove the cataractous nucleus and insert the IOL through ever-smaller incisions. For the last few years, bimanual microincisional phacoemulsification has been a subject of much interest. Recently, however, the development of new, thinner phaco sleeves has made it possible to perform coaxial phacoemulsification through 2-mm incisions. Four ophthalmologists share their thoughts about incorporating this technique into surgical practice.

—William J. Fishkind, MD

DONALD N. SERAFANO, MD

There is a desire to make cataract surgery as safe and effective as possible. Smaller incisions that maintain the proper wound architecture throughout and after the procedure should enhance safety, reduce the amount of surgically induced corneal astigmatism to less than 0.40D, and increase the predictability of the outcome.

How can a surgeon who is currently using an incision larger than 2.4mm establish a logical, step-by-step plan to adopt a microincisional technique? The beauty of coaxial microincisional surgery is that it is a natural step in reducing size. My recommended changes are as follows.

First, use a 2.3- or 2.4-mm keratome (it can progress down to 2.2mm) instead of your current size. Second, you may use a standard capsulorhexis forceps. As you progress to a 2.2-mm incision, however, you may need a microcapsulorhexis forceps or a needle cystotome. The standard, older capsulorhexis forceps may not open far enough within the smaller incision.

Third, I find that the most efficient combination is a 1.1-mm flared ABS tip combined with the Infiniti Vision System's low-compliance Fluid Management System and Ultra Sleeve (all technologies from Alcon Laboratories, Inc., Fort Worth, TX). If you are currently using a 0.9-mm microtip, the 1.1-mm tip will look different. No change in phaco technique is required for average fluidic settings, however. If you use aggressive vacuum and flow-rate settings, you should increase the bottle height and/or slightly reduce the vacuum setting.

Fourth, I recommend using the Ultra Sleeve on your current sleeved I/A tip. Additionally, I suggest selecting

a Royale 2 (one-handed, syringe-type inserter with spring; ASICO, Westmont, IL) and a C cartridge for the Acrysof insertion system (Alcon Laboratories, Inc.). The insertion should be made without any pause on the plunger. The incision will act as a continuation of the cartridge. Finally, use counter pressure during the IOL's insertion.

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—Donald N. Serafano, MD

JORGE L. ALIÓ, MD, PhD

Microincisional cataract surgery divides the functions of irrigation and aspiration into different hands and uses incisions that are less than 1.5mm long. Compared with traditional coaxial phacoemulsification, the microincisional approach has the advantages of better fluidics, allowing the use of higher vacuum levels, a lower effective phaco time due to a decrease in the total phaco power needed for cataract removal, and, most importantly, a virtual elimination of surgically induced astigmatism.¹ In a recent investigation by my group, microincisional cataract surgery did not change the aberration pattern of the operated cornea, whereas a 3-mm incision for coaxial phacoemulsification induced significant

changes in the pattern of corneal aberration (unpublished data).

I perform small-incision cataract surgery with microincisional IOLs in more than 80% of my cases. I operate through either a sub-1-mm incision with the Duet line of microsurgical instruments (Microsurgical Technology, Redmond, WA) or a 1.2-mm incision for hard cataracts with instrumentation I designed (Katena Products, Inc., Denville, NJ).

A microincisional approach allows me to control astigmatism and corneal aberrations fully. I can confidently implant toric or customized IOLs, make corneal incisions to treat preexisting astigmatism, and even perform LASIK to address astigmatism immediately before cataract removal in select cases. My practice has changed completely.

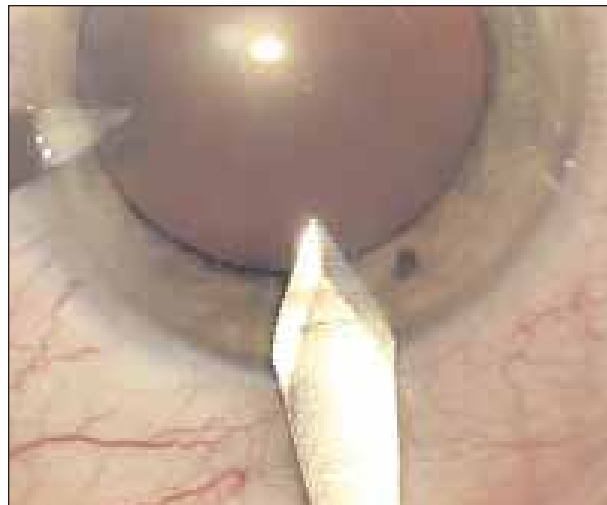
With small-incision cataract surgery, I prefer prechopping, which allows me to cut the cataract and saves an amazing amount of time and phaco energy during the procedure. The new Irrigating Stinger (Katena Products, Inc.) has improved my surgical ability. I can use this instrument for chopping, dividing fragments, facilitating aspiration, and locating fragments lost behind the capsular bag as well as for other special maneuvers. I need not change instruments, because I have everything I need in my hands. By switching hands, I can do everything I wish inside the anterior chamber at any location.

I currently prefer the 48S, toric, multifocal, and aspheric IOLs from Acri.Tec GmbH (Berlin, Germany; not available in the US). I look forward to working with the lens from Thinoptx (Abingdon, VA; not available in the US) in the future.

JAMES A. DAVISON, MD

After draping the eye, I grasp the HP 2.2-mm, bi-beveled keratome with my right hand and the 22.5° paracentesis blade (both knives from Alcon Laboratories, Inc.) with my left. I create the paracentesis incision with the blade first penetrating the limbal cornea to a depth of approximately 1.5mm while aimed toward the central anterior lens surface. The resultant width is approximately 0.4mm.

Next, I exert minimal upward pressure (toward the microscope) and simultaneously pull the dull edge of the paracentesis blade toward myself. This maneuver stabilizes the globe and counters the downward and repulsive pressure from the simultaneous penetration of the 2.2-mm keratome (also directed toward the central anterior lens surface) (Figure 1). Because the 22.5° blade fixates the globe, the keratome's penetration can be relatively slow and very controlled to generate a predictable 1.75-mm shelf. I withdraw the blade carefully and try to avoid side-ways wavering while the paracentesis blade continues to



(Courtesy of James A. Davison, MD.)

Figure 1. The internal and external aspects of the incision are internal and external sides of the 2.00-mm etched mark and make an approximately 1.75-mm shelf.



(Courtesy of James A. Davison, MD.)

Figure 2. The surgeon performs bimanual coaxial phacoemulsification with a 1.1-mm ABS Microflare tip and an Ultra Sleeve going through the 2.2-mm incision and a 0.3-mm cyclodialysis spatula through the paracentesis incision.

stabilize the globe. I then remove the paracentesis blade.

The entire process takes approximately 7 seconds. The incisions are always in a comfortable clock-hour position for bimanual phacoemulsification because of the natural positioning of my hands during the incision's creation.

After making the incisions, I inject lidocaine 1% and then viscoelastic before performing bimanual coaxial phacoemulsification. The 2.2-mm incision is the correct dimension for the tapered 1.1-mm ABS Microflare tip (Alcon Laboratories, Inc.) covered by the green-tinted Ultra Sleeve (Figure 2).

SIMONETTA MORSELLI, MD

Start with a fully dilated pupil to avoid iris prolapse through the incisions. Be on the alert for patients on drug therapy for prostatic hyperplasia, because they normally present with iris hypotony. Avoid patients with a shallow anterior chamber. For your first cases, I recommend selecting eyes with 2+ nuclear sclerosis.

Ensure that your instruments can pass through an incision of 2mm. A microcapsulorhexis forceps may be required in addition to a special rigid sleeve for the phaco tip. You may use your current phaco technique (eg, stop and chop) when transitioning to microincisional coaxial phacoemulsification.

“Start with a fully dilated pupil to avoid iris prolapse through the incisions.”
—Simonetta Morselli, MD

It will be necessary to adjust your phaco parameters. The 21-gauge tip is quite small. If you use a phaco system with a Venturi pump, you will likely need to employ high vacuum, although the exact values will depend on your machine. High flow rates are necessary with a peristaltic pump. Surge is not a worry due to the small phaco tip, but the length of the procedure may increase. Because the incision will be 2mm, surgeons may select the site for the wound that is most comfortable for them without concern about induced astigmatism. Quality IOLs are available that will pass through an incision of 2.2mm or less.

HIROKO BISSEN-MIJAJIMA, MD

You need not change your usual coaxial technique when transitioning to a microincision. It is safer to increase the bottle height by at least 10cm, however, because the thinner phaco sleeve reduces the amount of irrigation. To avoid a thermal burn, I recommend using an ultrasound pulse mode. The incision's size is based on the phaco sleeve: 2.1 to 2.3mm for the Ultra Sleeve and 1.8 to 2.0mm for the Nano Sleeve (Alcon Laboratories, Inc.).

I have found that the flared tip, which has a thinner shaft, allows more irrigation. Either a 0.9-mm or a 1.1-mm flared tip works for microincisional coaxial cataract surgery. If you are not familiar with the flared tip, be aware that inserting a phaco tip with a wide opening (especially a curved Kelman type) through a 2-mm incision may be slightly difficult. You may try inserting the tip upside down. In my experience, the silicone I/A tip provides the most working space.

I consider IOL implantation to be the hardest part of the entire procedure. A single-piece Acrysof lens (Alcon Laboratories, Inc.) may be implanted through a 2-mm incision using a C cartridge. My trick is to implant the IOL with a Monarch injector (Alcon Laboratories, Inc.). I simply push the C cartridge against the incision, and the IOL passes through the incisional tract. The counter-traction is necessary while the IOL advances into the eye. I usually place the tip of the phaco chopper inside the sideport to keep the eye centered. ■

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1. Alió JL, Rodríguez-Prats JL, Galal A, Ramzy M. Outcomes of microincision cataract surgery versus coaxial phacoemulsification. *Ophthalmology*. 2005;112:1997-2003.