# Transitioning to Bimanual Microincisional Phacoemulsification

Pearls for facilitating this change in surgical technique.

**BY DAVID F. CHANG, MD**

Bimanual microincisional phacoemulsification involves a unique and potentially difficult learning curve.[1] In addition to requiring new instrumentation, the phaco machine's parameters must be modified to compensate for reduced infusion inflow. Moreover, the incisions are less forgiving; too large an incision will cause chamber instability, whereas too tight an incision can cause oar-locking, which will create intraoperative corneal striae and impede instrument maneuverability. There are several steps that interested surgeons can take to prepare for and to facilitate the transitioning process. Fortunately, many of the component skills and techniques can be practiced while still performing coaxial phacoemulsification.

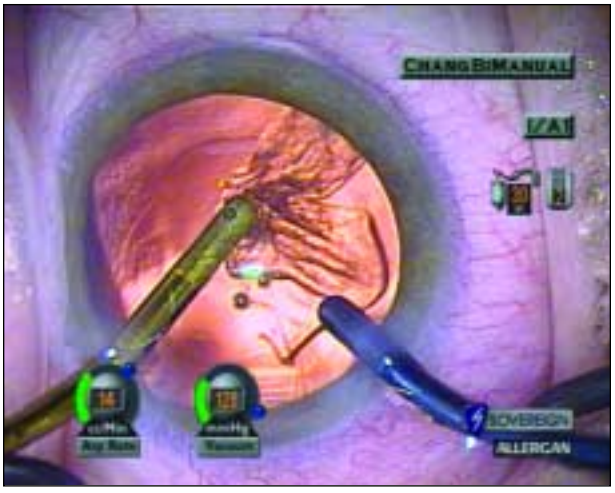



**Figure 1. The author performs bimanual I/A through separate 1.2-mm stab incisions placed on either side of a 2.7-mm coaxial phaco incision.**

> "Fortunately, many of the component skills and techniques can be practiced while still performing coaxial phacoemulsification."

Obviously, the dexterity of the surgeon's nondominant hand is particularly important in bimanual phaco techniques. Most ophthalmologists performing bimanual microincisional phacoemulsification prefer the chopping technique. For that reason, surgeons who are already adept at chopping have an enormous advantage when transitioning to the bimanual approach.

When learning any new method, case selection is very important. A soft-to-medium nucleus with a generous epinucleus is ideal. Before the first case, the surgeon should check with a representative from the phaco machine's manufacturer to learn what phaco power modalities and settings are recommended.

## PREPARATORY AND TRANSITIONAL STEPS

Prior to performing bimanual phacoemulsification for the first time, surgeons should gain experience with standard coaxial phacoemulsification using a 20-gauge microincisional phaco tip. In addition to requiring different fluidic settings, this smaller tip may also necessitate slight changes in technique, such as chopping the nucleus into smaller sized pieces. Second, one should perform a number of cases using bimanual I/A for cortical cleanup (Figure 1) as valuable practice with bimanu-

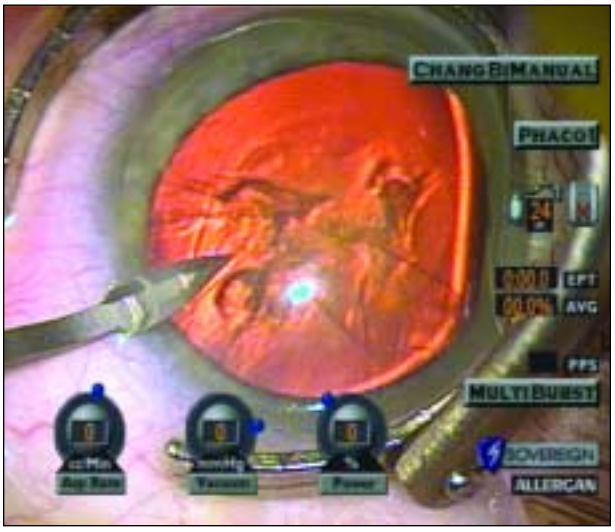



**Figure 2. The disposable 1.2-mm metal minikeratome (Microsurgical Technology, Redmond, WA).**


**Figure 3. Bimanual phaco incisions are placed on either side of a 2.7-mm coaxial phaco incision.**

al instrumentation and incisions. Although not essential, as a learning exercise, one can practice making a capsulorhexis using a bent, 25-gauge needle cystotome with bottle irrigation. One can always revert to a forceps technique under viscoelastic if difficulty arises, because the standard phaco incision has been made.

Rather than make the paracentesis incisions free-hand with a super blade, surgeons performing their first few bimanual cases should use a keratome that is sized to automatically create a 1.2-mm incision (Figure 2). Disposable metal keratomes are an adequate choice, or a 19-gauge disposable microvitreoretinal blade will work. Incisions made with a trapezoidal diamond blade will generally seal better and impede instrument maneuverability to a lesser degree than nontrapezoidal blades, but diamond keratomes are costly and not essential for success. For the transitioning surgeon, I recommend making a traditional clear corneal phaco incision centrally, in between the two 1.2-mm ports, before starting (Figure 3). Doing so helps for several reasons.

First, the radial length of the bimanual incisions becomes less important because the incisions will not be enlarged later. Second, this standard phaco incision will be needed for implanting a conventional foldable IOL. Finally, one can and should initially use this larger incision to perform a standard forceps capsulorhexis, as well as hydrodissection and hydrodelineation, in the usual fashion. Performing these steps through a 1.2-mm incision is more difficult. It is neither necessary nor advisable to take on these additional challenges when attempting bimanual microincisional phacoemulsification for the first time. Preparing this standard incision in advance also facilitates converting back to coaxial phacoemulsification if necessary. Reasons one may wish to convert include too small a capsulorhexis, a nucleus that does not rotate, an overly dense lens, and difficulty maintaining adequate chamber depth and stability.

## INSTRUMENTATION

I recommend a straight 20-gauge microincisional phaco tip with a 30º bevel, which will assist in introducing the tip through the incision. Flared tips and curved Kelman tips are inadvisable. Small amounts of fluid exit-

**Figure 4. The author employs a 20-gauge front irrigating chopper (Chang horizontal chopper tip; Microsurgical Technology) and a 20-gauge beveled phaco tip with a cut infusion sleeve to cover the hub.**

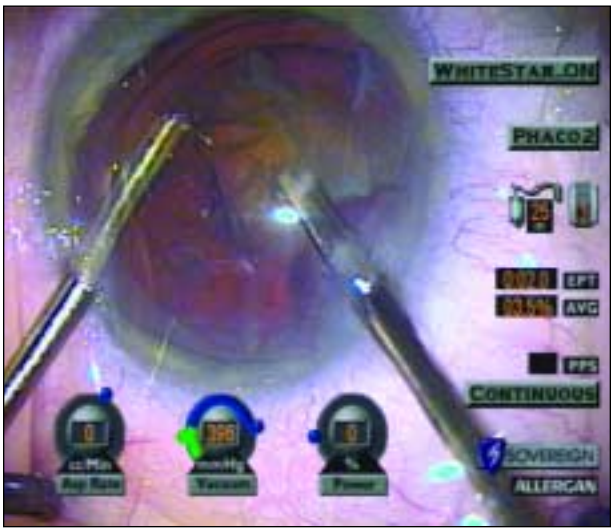



**Figure 5. The author performs bimanual phacoemulsification using the Sovereign with Whitestar hyperpulse technology (Advanced Medical Optics, Inc., Santa Ana, CA) and the MST irrigating chopper. Note that the infusion stream is directed away from the phaco tip as a mobile fragment is emulsified.**

ing the phaco incision will splash against the exposed phaco needle hub and cause an annoying spray onto the cornea. To prevent this misting, I cut off the shaft of a standard silicone irrigation sleeve such that only the hub remains (Figure 4). Threading this modified sleeve over the needle leaves the phaco tip exposed while shielding the needle's hub from splashing fluid.

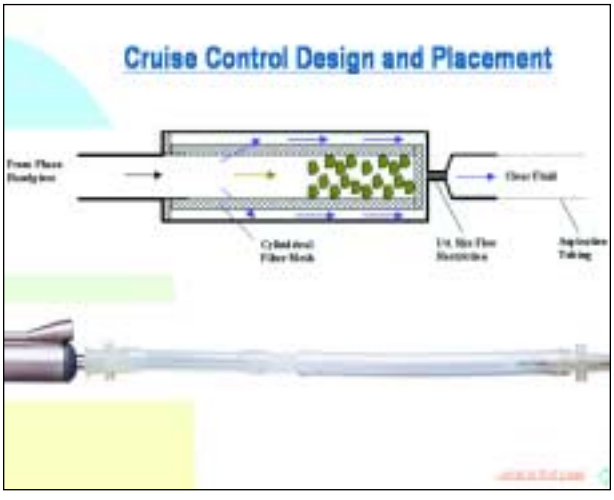
Of the many types of irrigating choppers available, most have 20-gauge external dimensions to allow for insertion through 1.2-mm incisions. The irrigation flow rates can vary significantly depending on the lumen size (determined by wall thickness) and whether the irrigation flows out of a single front opening or through paired side openings. Higher flow rates are generally achieved with a single front opening for irrigation. I use the MST (Microsurgical Technology, Redmond, WA) and Katena Products, Inc. (Denville, NJ), front irrigating choppers (Figure 4). This design creates a forceful stream of fluid directed along the axis of the chopper shaft, however. Pointing the irrigating opening toward the front of the phaco tip will have the unwanted effect of hydraulically blowing mobile fragments away from the tip. A front irrigating chopper should generally be aimed away from the phaco needle's tip for this reason (Figure 5). With practice, one can harness the hose-like effect to deliberately dislodge pieces of nucleus that become stuck alongside the phaco incision.

In addition to lower flow capacity, an additional disadvantage of side openings is that they may inadvertently exit the anterior chamber whenever the chopper tip is retracted too much. This situation can result in sudden and unexpected chamber shallowing. In choosing between a horizontal or vertical irrigating chopper tip, one should consider that there is an increased risk of chamber instability when transitioning to bimanual phacoemulsification, due to inexperience with incisions and fluidic settings for this technique. The dull tip of the horizontal chopper may be safer in this context.

The irrigating chopper is always inserted before the phaco tip for obvious reasons. Because the incisions seal so tightly with internal hydrostatic pressure, however, the surgeon should momentarily go to foot pedal position zero when introducing the phaco tip. If the attached irrigation tubing is stiffly coiled, it can be difficult to change the orientation of the chopper once it is inside the eye. Therefore, one should take a moment to hold the chopper in the desired orientation outside the eye. If the tubing tends to cause it to torque or rotate out of position, the chopper can be reattached in a more favorable alignment.

## FLUIDICS AND POWER MODULATION

To enhance irrigation flow, the bottle should be maximally raised. Some machines have the option of a bottle height extender. To avoid chamber instability, one should begin with lower aspiration flow and vacuum rates compared with those customarily used for coaxial phacoemulsification. The reason is the significant reduction in infusion flow rates compared with a standard coaxial infusion sleeve. I highly recommend the disposable Staar Cruise Control device (Staar Surgical Company, Monrovia, CA) to the transitioning surgeon (Figure 6). This $15 flow restrictor may be used with any phaco machine and prevents surge that would otherwise occur




(Courtesy of Staar Surgical Company.)

**Figure 6. The Staar Cruise Control flow limiter.**

when using one's standard coaxial high-vacuum settings during bimanual microincisional phacoemulsification.[2]

One should avoid continuous phacoemulsification in order to minimize the production of incisional heat. I use single, brief bursts of phacoemulsification (burst mode) to impale the nucleus for chopping and then hyperpulse for removing the quadrants and epinucleus (Figure 5). Hyperpulse not only prevents thermal injury, but it also improves followability by diminishing the repelling chatter that is more apt to occur with smaller phaco needles.[3-7]

## CONCLUSION

Despite the absence of microincisional, rollable IOL technology in the US, many surgeons are interested in trying and evaluating bimanual microincisional phacoemulsification. Fortunately, the additional instrumentation required (irrigating chopper, disposable Cruise Control, metal minikeratome) is minimal if one simply wishes to try the technique a few times. Particularly with hyperpulse, one is able to easily switch back and forth between the two procedures and setups, which is a reassuring contingency if difficulty arises. ■

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