Our preferred cataract surgery technique is biaxial microincision cataract surgery (MICS). The separation of irrigation from aspiration and ultrasound during biaxial MICS allows us to direct inflow separately from where ultrasound and aspiration are deployed. The main benefit of biaxial MICS is greater anterior chamber stability compared with other MICS techniques, especially when dealing with complex cases such as intraoperative floppy iris syndrome or zonular loss. Below is a description of our technique; two accompanying videos can be viewed at http://eyetube.net/?v=fipow and http://eyetube.net/?v=kidof.

INCISIONS, IRRIGATION, AND ASPIRATION

We use two 1.5-mm incisions that allow the irrigating chopper and the ultrasound probe to be swapped from one incision to another—a useful maneuver when nuclear rotation must be avoided, such as in an unstable anterior chamber. Additionally, during training in transition to biaxial MICS with two incisions of equal size, a supervising surgeon with opposite hand dominance to that of the trainee can take over easily if required.

Biaxial irrigation and aspiration through two paracenteses establishes anterior chamber stability superior to that of coaxial irrigation and aspiration systems. Biaxial phaco brings a similar degree of stability to the phacoemulsification part of the procedure. The irrigation stream is directed toward the anterior chamber so that irrigation does not cause turbulence at the phacoemulsification site. The iris remains relatively undisturbed compared with use of a coaxial approach, where the irrigation flow is adjacent to the ultrasound port and often under the iris plane. With biaxial MICS, the irrigation reaches the underside of the iris plane only during chopping, when there is minimal flow in the system due to complete occlusion of the phaco probe.

We prefer a superior approach, with 1.5-mm incisions at the 2- and 10-o’clock positions. This placement minimizes postoperative astigmatism and facilitates early healing. In a combined anterior/posterior segment procedure, these incisions do not allow the anterior chamber to become shallow, even when deep scleral depression is done as part of the pars plana surgery.

ULTRASOUND AND SCULPTING

We use hyperpulse (100 pulses per minute) and low duty cycles (20%–30%) to minimize ultrasound use, thereby...
With the irrigation directed in the plane just above the iris and centrally, it is remarkable how solidly the lens segments are held in the center of the pupil.

Reducing endothelial cell loss. This approach, in combination with the advanced fluidics of modern machines, has decreased the incidence of wound burns, even with hard cataracts. Additionally, an irrigating sleeve is no longer needed to cool the phaco probe. Therefore, neat and deep sculpting grooves can be made with the bare phaco needle because the irrigation sleeve no longer has to be accommodated in the groove.

During sculpting, our default ultrasound power is 30% at 100 pulses per second with 40% duty cycle. We use either the Stellaris or Millennium platform (both by Bausch + Lomb, Rochester, New York), with the vacuum set at 60 mm Hg and the bottle height at 75 cm. During phacoemulsification, we employ a divide-and-conquer technique. One benefit of the biaxial MICS technique is that the irrigation probe can be used as a second instrument. In fact, the flow of fluid can be used to gently move tissue or smaller nuclear fragments without engaging the metallic part of the instrument. This allows gentle tissue manipulation and reduces the total number of instruments used in the eye and the number of times an instrument change is needed.

SEGMENT REMOVAL

During segment removal, we increase our maximum ultrasound power to 50% at 50 pulses per second and 20% duty cycle. Vacuum is set anywhere from 180 to 400 mm Hg and is controlled independently from ultrasound power by the Dual-Linear footpedal (Bausch + Lomb). Bottle height is increased to 100 cm. Followability of lens fragments is enhanced as a result of the combination of power modulation (particularly the reduction of duty cycle to minimize chatter) and the stable anterior chamber. Even with these advances, the surgeon still should engage and move segments with aspiration only after applying ultrasound power. Because a stable anterior chamber is maintained with our technique, we feel it is relatively safe to emulsify nuclear segments in the anterior chamber; in this position, the ultrasound probe is clear of the posterior capsule, and we are confident that the endothelium will be held well away from the lens fragments.

The rigid irrigating chopper is available to help chop stubborn segments if desired. With the irrigation directed in the plane just above the iris and centrally, it is remarkable how solidly the lens segments are held in the center of the pupil, without small fragments drifting into the fluid currents. Soft lens matter removal is conducted within a vacuum limit of 550 mm Hg and with a bottle height of 75 cm. We use bimanual irrigation and aspiration for the same reasons described above.

CONCLUSION

As is the nature of technological advances, some areas progress faster than others; therefore, unfortunately, we have to slightly enlarge one of the incisions to permit lens insertion. We routinely use the Akreos Micro Incision Lens (Bausch + Lomb) implanted through a 1.8-mm incision using a wound-assisted technique. This acrylic lens is also well suited to combined anterior/posterior segment surgery and does not cause problems with silicone oil tamponade, should it be needed.

We have been using biaxial MICS routinely for more than 4 years in all cases. In our hands, this technique offers better surgical control than other techniques and good postoperative outcomes.

Som Prasad, MS, FRC(Ed), FRCOphth, FACS, practices in the Eye Department, Arrowe Park Hospital, Wirral University Teaching Hospitals, NHS Foundation Trust, United Kingdom. Dr. Prasad states that he is a consultant to and receives travel reimbursement from several companies including Bausch & Lomb. He may be reached at tel: +44 1516047193; fax: +44 1516047152; e-mail: sprasad@rcsed.ac.uk.

Farhan Quereshi, MBChb(Hons), FRCOphth, practices in the Eye Department, Arrow Park Hospital, Wirral University Teaching Hospitals, NHS Foundation Trust, United Kingdom. Dr. Quereshi states that he has no financial interest in the products or companies mentioned. He may be reached at tel: +44 780 114 0121; e-mail: farhanquereshi101@hotmail.com.

**TAKE-HOME MESSAGE**

- Biaxial MICS is especially helpful in complex cases.
- Placing 1.5-mm incisions at the 2- and 10-o’clock positions minimizes postoperative astigmatism and facilitates early healing.
- The irrigation probe can be used as an additional instrument to gently manipulate tissue and move small nuclear fragments.

---