Microincision cataract surgery (MICS), defined as cataract extraction through incisions of less than 1.8 mm by Jorge L. Alió, MD, PhD, of Alicante, Spain,¹ is preferred by many practitioners today. Since the pioneering work of Amar Agarwal in the late 1990s,² the development of microincision instruments, phaco platforms, injector systems, and MICS IOLs have made it possible to routinely perform phacoemulsification through a sub–2-mm incision. As detailed in this article, most MICS techniques do not differ from the techniques used in standard phacoemulsification. They do, however, provide additional benefits including faster visual recovery and optimal postoperative results.

A video demonstration of my technique may be viewed at http://eyetube.net/?v=saden, and a written description follows.

INCISION

The construction of the incision is a key factor for success with MICS. I prefer a grooved clear corneal incision located just anterior to the vascular arcade. Additionally, I use a square wound construction because, as originally demonstrated by Paul Ernest, this configuration optimizes wound stability.³

The incision location can be either superior or temporal with a sub–2-mm incision size because there is a negligible impact on surgically induced astigmatism. Flexibility in incision placement is an advantage over conventional cataract surgery with 2.5- to 3.0-mm incisions, where a temporal approach is preferred to minimize surgically induced astigmatism. I also use precalibrated trapezoidal diamond knives (1.5 X 2.0 mm), which also allow me to perform limbal relaxing incisions (LRI)s of various depths during surgery. I use more affordable trapezoidal metal knives (1.6 X 1.8 mm), which provide a well-calibrated incision tailored to the phaco and I/A probes. I have adopted a crown-shaped incision with an internal flare, as described by Robert H. Osher, MD, of Cincinnati.⁴ This wound configuration provides more flexibility for maneuvering the probe, creates less resistance in the tunnel during the procedure, and results in almost no leakage or induced astigmatism. The main and sideport incisions are systematically inspected and hydrodissected at the end of the procedure.

CAPSULORRHESIS AND HYDRODISSECTION

Standard capsulorrhexis forceps are not adapted for sub–2-mm incisions, and therefore MICS-specific forceps are recommended because they provide sufficient opening of the blades. They perform best 180° away from the incision. The use of a 25-gauge needle is a viable alternative. To optimize endothelial protection,
the capsulorrhexis is performed under a combination of cohesive and dispersive ophthalmic viscosurgical devices (OVDs), as Arshinoff suggested in his soft-shell technique.5

Hydrodissection begins after the eye is partially decompressed by removing some of the OVD. This avoids excessive pressure on the posterior capsule and zonules. Minimal fluid is injected under the anterior capsule, by first lifting the rhexis edge and then directing the fluid stream toward the equator to complete the wave below the nucleus. This maneuver can be repeated until the nucleus rotates easily.

PHACOEMULSIFICATION

I prefer a stop-and-chop technique in most cases, starting with an initial central groove and eventually splitting the nucleus into two pieces with a Sinskey hook. Other techniques, such as divide-and-conquer and phaco chop, are also compatible with MICS.

To avoid excessive resistance or leakage, the incision size should match the diameter of the phaco needle, the type of sleeve, and the I/A probe. Throughout the procedure, lateral movements should be avoided to minimize wound distortion.

My settings with the Stellaris MICS Vision Enhancement System (Bausch + Lomb, Rochester, New York) are listed in Table 1. The goal is to maintain cool phacoemulsification, giving priority to phaco fragmentation and aspiration. For the irrigation and aspiration phase, vacuum is set linearly up to 550 mm Hg, with the bottle height at 100 cm and the rise time at 1.

The wireless pedal of the platform allows dual-linear control of power and vacuum. I control the power in the up-and-down direction (up to 50%) and the vacuum side-to-side (up to 550 mm Hg).

My preference is for a 20-gauge straight-tipped phaco probe with 30° flare. I use StableChamber tubing (Bausch + Lomb; Figure 1) placed on the aspiration line. This device includes a filter that retains small lens fragments and low-compliance tubing of different diameters. The system increases resistance to outflow, optimizes followability even at high levels of aspiration, and minimizes postocclusion surge.

I/A AND IOL IMPLANTATION

New disposable silicone- or polymer-sleeved I/A probes provide a safe and efficient method of cortex removal and appear to be particularly capsule-friendly (Figure 2). With currently available MICS IOLs and injector systems, wound-assisted injection is the preferred technique for MICS IOL implantation. I use a disposable plunger-type injector (Medicel AG, Wolfhalden, Switzerland), which has 1.25- and 1.65-mm internal and external diameters, respectively. These diameters are adapted to 1.8-mm incisions and allow implantation of MICS IOLs, such as the Akreos MICS (Bausch + Lomb) and the Asphina (Carl Zeiss Meditec, Jena, Germany), without enlarging the wound. The eye is stabilized horizontally during implantation with an instrument inserted into the sideport incision.

### TABLE 1. PHACO SETTINGS

<table>
<thead>
<tr>
<th>FOR SCULPTING:</th>
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<tbody>
<tr>
<td>Bottle height:</td>
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<tr>
<td>Vacuum:</td>
<td>60 mm Hg</td>
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<tr>
<td>Linear US‘ power:</td>
<td>up to 40% with 70 pulses per second</td>
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<tr>
<td>Duty cycle:</td>
<td>40%</td>
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<tr>
<td>Rise time:</td>
<td>set at 1</td>
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<table>
<thead>
<tr>
<th>FOR FRAGMENTS:</th>
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</thead>
<tbody>
<tr>
<td>Bottle height:</td>
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<td>Vacuum:</td>
<td>80–400 mm Hg</td>
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<tr>
<td>Linear US power:</td>
<td>40% with 70 pulses per second</td>
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<tr>
<td>Duty cycle:</td>
<td>40%</td>
</tr>
<tr>
<td>Rise time:</td>
<td>set at 1</td>
</tr>
</tbody>
</table>

* US = ultrasound
THE FUTURE OF MICS

MICS has become a reality for an increasing number of surgeons, and most cataract surgeries can be performed with this minimally invasive technique. Standard phaco techniques developed for use with incision sizes closer to 2.5 or 3.0 mm are compatible with MICS and allow smooth transition with almost no learning curve. Current phaco platforms, micro-sized instruments, MICS injectors, and IOLs work in symbiosis to optimize the safety and efficiency of MICS. A further reduction of incision size is already a priority in pioneering minds, and tomorrow the reference incision size could be less than 1.0 mm.

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TAKE-HOME MESSAGE

- A square wound design optimizes wound stability.
- With MICS, the incision can be placed either superiorly or temporally without inducing astigmatism.
- During phacoemulsification, lateral movements should be avoided to minimize wound distortion.
- Wound-assisted IOL implantation is preferable with MICS.

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