

# Coaxial microphaco technique “revolutionary”

COAXIAL microphaco-emulsification with IOL implantation through a 2.2-mm incision is a revolutionary advance in cataract surgery offering all of the advantages of standard coaxial surgery and modern, large optic IOL technology with the added benefit of a smaller incision size, according to Robert H. Osher MD, Professor of Ophthalmology, University of Cincinnati College of Medicine, Ohio, US.

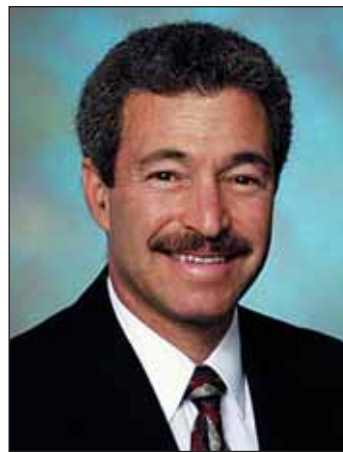
The procedure utilises a new 2.2 mm ultrasound sleeve (Ultrasleeve) that is used with the Infiniti Vision System (Alcon) and a 1.1 mm Infiniti Flared tip. Dr Osher first undertook extensive laboratory testing comparing its performance characteristics against sleeveless bimanual microincision phaco. The results of those studies demonstrated that coaxial microphaco was superior with respect to fluidics, heat generation, and incision competency, Dr Osher told the XXIII Congress of the ESCRS.

Encouraged by those findings and after developing a technique that allowed implantation of a

full-size, 6.0 mm, one-piece acrylic IOL through an unenlarged 2.2 mm incision, Dr Osher took the new procedure into the clinic.

**“Because of its many limitations, I believe sleeveless bimanual microincision surgery has not fulfilled its initial promise”**

Results of a study enrolling 100 consecutive cataract surgery patients demonstrated that coaxial microphacoemulsification had a very favourable intraoperative performance profile, allowing safe and efficient cataract removal, and yielded postoperative outcomes matching those achieved with standard coaxial surgery.



Robert H Osher

In his clinical study, Dr Osher assessed anterior chamber stability, incision competency, and ease of IOL delivery, as well as postoperative UCVA, IOP, incision appearance, and corneal appearance. The results from his 100 cases were extremely solid, he commented.

“We have all been eager to take the next step forward in the evolution of cataract surgery and further reduce our incision size. However, because of its many limitations, I believe sleeveless

bimanual microincision surgery has not fulfilled its initial promise for making that change. Considering the positive findings from my laboratory and clinical studies, and that coaxial microphaco is a technique that can easily be transitioned to by any skilled phacoemulsification surgeon, I consider it a major step forward in the evolution of cataract surgery and expect that it will be rapidly adopted into widespread use,” he said.

Although he had been performing sleeveless bimanual phaco for several years with satisfactory results, Dr Osher said he was never completely happy with the technique because of its inferior fluidics profile and problems with incision competency. Furthermore, sleeveless bimanual phaco requires a new set of specialised instruments and has a steep learning curve that makes it difficult to teach to younger surgeons. Additionally, in the US where ultra-small incision IOLs are not available, IOL implantation necessitated incision enlargement or creation of a separate, larger incision.

“As a result, the sleeveless bimanual technique lost any advantage of smaller incision surgery, and even if the newer IOLs were available here, their use would be a trade-off for all of the safety advantages and optical features available using conventional IOLs,” Dr Osher said.

## Better fluidics with coaxial

Intrigued by what he saw as the potential of the coaxial microphaco procedure to overcome those limitations of sleeveless bimanual surgery, Dr Osher and colleagues developed the protocol for their laboratory studies.

In one experiment, they measured infusion flow into the eye when operating with 19, 20, and 21 gauge irrigation choppers through a 1.2 mm incision and compared it with the Ultrasleeve through a 2.2 mm incision. The infusion bottle height was kept constant at 100 cm. The flow rates using the various irrigating choppers ranged from 20 to 60 cc/min and were significantly less than the 85 cc/min rate achieved using the Ultrasleeve.

## New torsional ultrasound increases phaco safety



Khium Tjia

TORSIONAL ultrasound performed using a new handpiece (Ozil) and software upgrade for the Infiniti Vision System (Alcon) enhances the safety and efficiency of phacoemulsification and augments the benefits of ultra-small incision coaxial phacoemulsification, according to Khium Tjia MD, Isala Clinics, Zwolle, The Netherlands.

With torsional ultrasound, there is a 32 KHz ultrasonic movement of the phaco tip but with only about one degree of

torsional movement of the phacotip shaft. It is performed using a 45-degree tapered Kelman tip because the unique eccentric end mass of that particular tip amplifies the benefits of the transverse ultrasonic movement.

**“With this technology, I believe it is possible to use 100% continuous ultrasound without risk of wound burn,”**

### Reduced heat

As a result of the minimal tip movement with torsional ultrasound, heat production at the incision site is only about one-third of that occurring with traditional longitudinal

ultrasound. In addition, since there is no intrinsic repulsion of the nuclear material as there is with longitudinal ultrasound, the effectiveness of emulsification is greatly improved with the torsional technique.

“With this technology, I believe it is possible to use 100% continuous ultrasound without risk of wound burn, and there is also better followability and holding force that can compensate for the reduced irrigation flow occurring with smaller phaco sleeves. Those features add up to nucleus removal that is very safe, fast and efficient,” said Dr Tjia.

He demonstrated its performance by showing videos from a series of cases with dense cataracts, including some where he began the procedure using conventional longitudinal ultrasound in linear burst mode and then switched to 100% torsional ultrasound with the new handpiece.

“The difference in speed is striking, and continues to amaze me even after working with this technology for a year. Although we were satisfied with traditional ultrasound when it was all that

was available, with access to new technology, it is easy in retrospect to see the difference and appreciate the benefits,” said Dr Tjia.

**“The torsional technique takes repulsion out of the picture to make footswitch control very easy, even for heavy-footed surgeons,”**

### Makes dense cataracts easier to remove

He observed that while torsional ultrasound offers safety and efficacy in all cases, it truly excels in the most difficult eyes with hard, dense, dark nuclei.

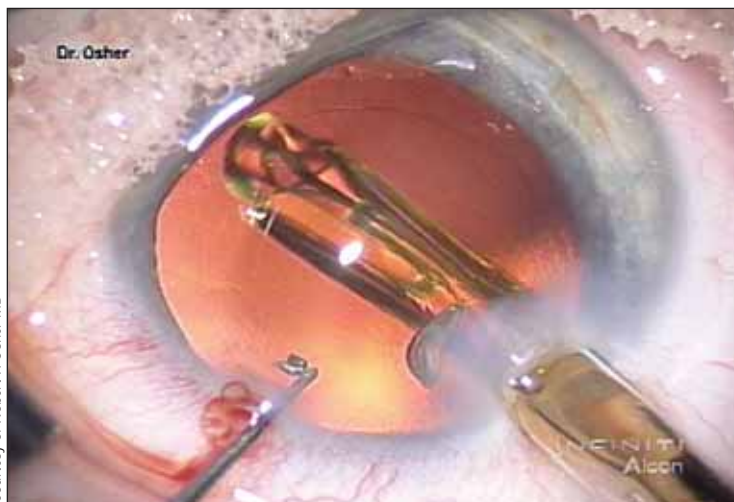
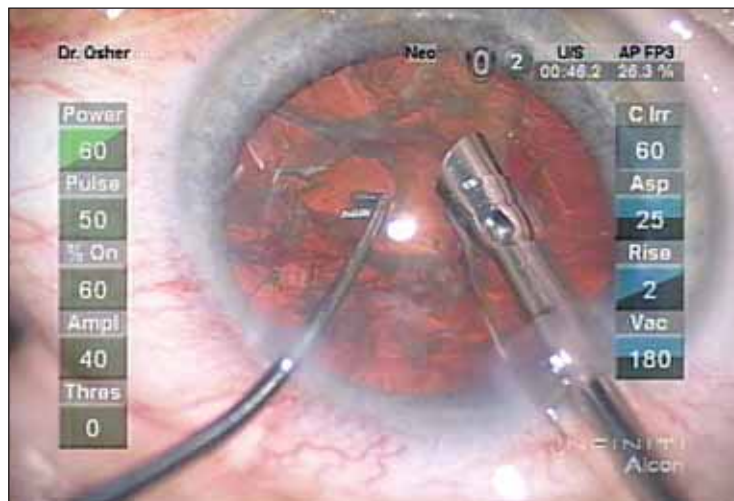
“Removing these types of cataracts has presented surgeons with a real challenge, but there is

no need to fear them anymore. It is important to use a slow chop technique, but getting rid of the quadrants is no longer a hard task,” he said.

Dr Tjia observed that when performing standard coaxial phaco, reduced duty cycles with built-in pauses are necessary to minimise heat production and compensate for chatter and repulsion. The pauses help to reduce heat build-up at the incision and allow the repelled nuclear material to return to the tip. In contrast, 100% power can be used with the torsional technique.

Another benefit of torsional phaco is that it eliminates difficulty with footswitch power control.

“With footswitch control of power during longitudinal phaco, it could be challenging at times to achieve the correct, delicate balance between efficacy and repulsion. The torsional technique takes repulsion out of the picture to make footswitch control very easy, even for heavy-footed surgeons,” Dr Tjia said.



Courtesy of Robert H Osher MD

“These data confirm the coaxial technique affords much better fluidics and that translates into safer, more stable chambers,” Dr Osher said.

Studies of surge further corroborated the fluidics advantage of the coaxial technique. Working in a test chamber at five different vacuum

levels in the range between 100 and 500 mmHg, use of the Ultrasleeve was consistently associated with less surge than the sleeveless bimanual technique. Incision leakage measured as fluid loss around the tip over a one-minute period was also three to seven-fold greater during sleeveless bimanual surgery versus coaxial microphaco.

“The flexible Ultrasleeve fills, seals, and protects the incision better than the metal bimanual needle and so it was not surprising to see its benefit for minimising wound leakage,” Dr Osher said.

#### Less heat

The study also included an assessment of heat generation when operating in cadaver eyes and using a thermal camera to measure the temperature at the phaco tip. While both systems remained cool, Dr Osher acknowledged being somewhat surprised to find the tip temperature was relatively lower using the coaxial technique. In retrospect, however, the results made sense.

“Aspiration bypass and an insulated sleeve act in concert to help cool the tip when performing coaxial surgery but play no role when working with a sleeveless tip,” Dr Osher said.

The researchers also evaluated the competency of the 1.2 mm and 2.2 mm incisions through fluorescein testing. After one minute of phaco time with constant settings, the incisions in cadaver eyes operated on with

the coaxial microphaco technique consistently demonstrated greater competency than the sleeveless bimanual group when tested for sealability immediately after phaco handpiece withdrawal.

#### New implantation technique for unenlarged incision

To maintain the benefit of the 2.2 mm incision at the end of the case, Dr Osher worked in human cadaver and porcine eyes to develop a method for implanting a 6.0 mm, single piece, foldable IOL through an unenlarged incision. The approach he designed uses a C cartridge (Alcon) plus a plunger style inserter (Asico Royale or Duckworth & Kent) with a counter-traction technique and achieves reliable delivery of single-piece acrylic IOLs (SN60AT, SA60AT, ReStor® (Alcon) with a final incision size usually no greater than 2.3 mm.

In testing various modifications to the implantation approach, Dr Osher found it was important that the IOL be loaded in a manner identical to that depicted in the directions-for-use which is also indicated by the etching on the cartridge.

After creating a firm eye by filling it with a cohesive viscoelastic, he then places the inserter bevel down through the incision, and introduces a second instrument through the stab incision to provide counter-traction. Application of firm and steady pressure to depress the plunger at a relatively rapid pace is also important to deliver the IOL efficiently and freely through the

2.2 mm incision.

“Working simultaneously but independently, Takayuki Akahoshi MD, also devised the same method for effectively implanting a full-size IOL without having to enlarge the incision or make a separate one. Therefore, using coaxial microphaco, surgeons can provide patients the benefits of smaller incision surgery together with all of the attributes of current IOL technology, including low PCO rates, optimal centration, macular protection, aberration reduction, toricity, and multifocality,” Dr Osher said.

“And the future? Now I’m combining 2.2 mm ultrasleeve technique with torsional ultrasound. Times are really exciting!” he added.

[rhosher@cincinnatieye.com](mailto:rhosher@cincinnatieye.com)