
a report by
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Prejudice 1 – ‘The Emulsification Power of Micro-incision Cataract Surgery Is Reduced’
This is not the case, because with the CO-MICS 2 tip–sleeve combination the outer diameter of the tip is considerably different from that of the bevel angle. In the traditional design, the interface between the sleeve and the tip is at the distal end (see Figure 3). In the smart design, the distal end of the phaco tip has a larger diameter and its interface with the sleeve has a smaller diameter, just behind the distal end (see Figure 4). The emulsification power is therefore calculated as follows: all end faces perpendicular to the ultrasonic motion fragment the nuclear particles. The emulsification power is proportional to the square of the cross-sectional area defined by the outermost and the innermost diameter, as presented in Figure 5. The emulsification power is proportional to the square of the cross-sectional area defined by the outermost and innermost diameter, as presented in Figure 5 (area A).

The calculations in Table 1 show that the emulsification power is even better than with the traditional 19G tip design through 2.8mm, which is supported by my intraocular experience. The first time I saw the CO-MICS 2 tip I thought the angle of the tip might be too steep, but the design turned out to be an advantage in everyday cataract surgery – especially in hard nuclei – once I became accustomed to it.

Prejudice 2 – ‘The Holdability of a Smaller Tip is Insufficient’
This is not the case, because holdability is proportional to the area of the aspiration opening (see Figure 5, area B), as calculated in Table 2. In my experience this is advantageous in softer nuclei.

Prejudice 3 – ‘The Aspiration Efficiency of a Small Tip is Reduced’
This is not the case, because the flow of the phaco tip depends on the vacuum pressure applied by your phaco machine. Figure 6 shows the relationship between the vacuum and the flow rate for a traditional and a CO-MICS 2 tip. As you can observe, you have to raise the vacuum pressure by only 100–150mmHg to obtain the same flow rate.

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Six years of high-volume outpatient ophthalmo-surgery (about 15,000 surgical cases) in the anterior and posterior segment are very demanding for a surgical platform. I have been lucky to be able to use the OS3/NovitreX® system by Oertli® over this time period and to be part of rapid developments in ophthalmo-surgery. Due to innovations such as this, we ophthalmo-surgeons have been able not only to dramatically improve our surgical outcomes and the comfort and needs of our patients, but also to push the frontiers of our discipline still further.

My decision to use the OS3 was due to Oertli’s long-standing experience in cataract and vitreoretinal surgery, the Swiss tradition of precise engineering, the ability to change pump systems with a switch of the foot pedal and the direct key mode that allows easy and quick handling of the machine without having to work your way through decision trees on a monitor, as well as the possibility of uncomplicated installation of updates.

Anterior Segment Surgery – Micro-incision Cataract Surgery
The most important innovation in cataract surgery during the last decade, besides the design of a modern, customised intraocular lens (IOL), has been the development of micro-incision cataract surgery (MICS) through incisions of 1.8mm and less. The first approach was bimanual MICS, with separation of the irrigation and aspiration pump handpieces. To avoid corneal burns with the phacoemulsification tip, the pulse mode and, later, the burst mode were introduced, which allowed ‘cool phaco’. Nevertheless, one problem remained unsolved and prevented the widespread use of bimanual sleeveless MICS: leakage during surgery resulting in an uncomfortable spraying phenomenon because the incision was too big and non-watertight, or leakage after surgery resulting in non-watertight wounds because the tips were incarcerated into the incisions too tightly during surgery.

The obvious solution was monomanual MICS or co-axial MICS (CO-MICS) using a sleeve as in conventional phaco. The evolution of Oertli’s tip sizes is shown in Figure 1. As an incision size less than 2mm is postulated to avoid surgically induced astigmatism, the breakthrough was the development of the CO-MICS 1 tip, which we could use through a 1.6mm incision. Figure 2 shows pentacam keratography before and after CO-MICS: the goal of no induction of surgical astigmatism was achieved. The only disadvantage of the CO-MICS 1 tip was the reduced holding power due to the smaller tip opening. One year later we were able to publish the first results with the CO-MICS 2 tip at the Meeting of German Ophthalmic Surgeons (DOC) in June 2008 in Nuremberg, which overcame the existing prejudices against CO-MICS.

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Prejudice 4 – ‘The Chamber Stability of a Small Tip Is Worse Than for a Larger Tip’

This is not the case, because according to Table 2 the CO-MICS 2 tip shows better anterior chamber (AC) stability in all vacuum settings, and the required 100–150mmHg increase in vacuum pressure results in the same AC stability as conventional phaco.

In addition to the advantages of an astigmatism-free incision and excellent phacodynamics, I would like to point out some positive clinical observations I experienced as a first-time user, which I have shared on various occasions with the following colleagues: S Binder (Vienna), J Bolger (London), T Burton (Norwich), S Chawla (Lucknow), A Dosso (Geneva), A Gandorfer (Munich), J Garweg (Bern), S Haldipurkar (Mumbai), B Marcon (Monfalcone), R Menapace (Vienna) and Ch Prünte (Vienna).

First, the flat AC aids in small pupil surgery: due to the reduced CO-MICS 2 tip diameter and size, the surgeon’s view is much less obstructed. The surgeon can thus avoid pupillary stretching, and the flat AC also means the surgeon has more room in which to manoeuvre.

Second, the smaller incision size results in a more stable post-operative wound, which is important for the following clinical situations: endophthalmitis; vitrectomised or highly myopic ‘floppy’ eyes; peripheral corneal degenerations; combined cataract and ppvitrectomy surgery; and when a clear cornea incision is needed, such as in cataract surgery after glaucoma filtrating procedures or for ocular surface disorders.

Third, in modern phacorefractive surgery the implantation of toric IOLs is a routine procedure. We published the first results of the implantation of toric, bifocal IOLs at this year’s DOC meeting in Nuremberg. For both toric and toric, bifocal IOLs – and especially for the latter – the predictability of the surgical outcome is essential for patient satisfaction and can be guaranteed only with careful pre-operative keratoscopy and biometry together with astigmatism-free surgery.

Taking all of this into account, by using the Oertli OS3 system surgeons will be well equipped for innovative, effective and safe cataract surgery.

Posterior Segment Surgery – Transconjunctival Autoseal 23G PPVitrectomy and High-speed Cutting

When Oertli’s research and development (R&D) manager Silvio Di Nardo announced the first instrumentation for 23 and 25G surgery years ago, I was very excited about this new method. I reserved 15 more minutes than a normal time slot (30–45 minutes) in my surgical plan for combined cataract surgery and membrane peeling for macular pucker surgery. After 30–45 minutes I completed the surgery and was amazed at how easy and patient-friendly this new method was: no conjunctival preparation, no sutures, easy handling and a nearly sensation-free procedure, with patients having white eyes the first day post-operatively. I have to stress that I completed only one case with the 25G system, because I did not like the prolonged surgical time in comparison with 23G surgery, nor the higher flexibility of the 25G instruments.

Two technical challenges Oertli shared with other 23G systems remained: prolonged vitreous removal time or loss of efficiency in aspiration, and leakage through the pilot tubes. The prolonged vitreous removal time or loss of efficiency in aspiration, as well as vitreoretinal traction, was significantly reduced with the introduction of a high-speed cutting vitrectome with...
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3,000 cuts per minute. Figure 8 shows the effect of high-speed cutting. Of course, surgeons do not want a negative influence on fluidics. Most vitrectomes rely on a spring system, which does not allow an exact opening time for the cutter during the cutting cycle. The spring is simply too slow and will not allow for complete and fast opening of the cutter, and as a result the surgeon will see a decrease in aspiration. This does not happen with the Twinac system, as it is based on a special valve system and thus aspiration efficiency will not be affected. Furthermore, the closing force of the Twinac cutter, another parameter for cutting quality in high-speed vitrectomy, remains at 0.2kg applied to the tissue even at 3,000 cuts/minute. Although the main advantage of high-speed cutting is clearly visible when working close to the retina, higher cutting rates can also be applied in core vitrectomy without losing aspiration efficiency.

**Conclusion**

Over the last six years I have never regretted working with the Oertli OS3/NovitreX. It has been constantly upgraded and adapted for top-quality, modern and innovative anterior and posterior ophthalmosurgery, and is a reliable tool that has been continuously improved by dedicated engineers in close co-operation with high-volume experienced surgeons in short cycles.

All figures and calculations courtesy of Oertli.