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By Lynda Charters

Efficiency and Clinical Outcomes Using Venturi and Peristaltic Pumps in Different Phaco Modalities

Reviewed by Matteo Piovella, MD

San Francisco—A comparison of the Venturi and peristaltic pumps in different phaco modalities demonstrated the superiority of a phacoemulsification system that incorporates both technologies. The Whitestar Signature with ELLIPS FX Technology (Abbott Medical Optics [AMO]) seems to provide the best features of longitudinal and transverse procedures and achieves good outcomes. Matteo Piovella, MD, discussed this technology during the American Society of Cataract and Refractive Surgery meeting.

Phacoemulsification procedures have improved continuously over the years, including reductions in turbulence and trauma in the eye, clearer corneas postoperatively in the short term, less endothelial cell loss over the long term, a lower incidence of serious complications, improved ability to manage challenging cases, and a better patient and surgeon experience. The phaco technology has evolved from the traditional longitudinal ultrasound procedure to micropulse “cold” phaco/power modulation with pulse shaping to the newest generation of torsional and transverse ultrasound, Dr. Piovella pointed out.

Having said that, there is still room for improvement. Current areas of ongoing study include modifications to the phaco tip, phaco energy waveforms, tip-fragment interaction, understanding and enhancing cavitation, and interaction of mechanical and cavitation power.

In torsional phaco, the bent tip moves side-to-side, which increases the safety because of less trauma than traditional phaco, and the contact with the nucleus is more constant compared with traditional phaco, resulting in a more efficient procedure. Maintaining suction can be challenging.

Transverse phaco procedures result in reduced repelling forces, less chatter, and less wound friction. The Whitestar System decreases endothelial loss and can be performed with a straight or bent phaco tip, according to Dr. Piovella.

“The Whitestar System is the only commercially available phaco technology that blends longitudinal and transverse modes,” Dr. Piovella said. It provides constant emulsification, which reduces clogging of the phaco tip and allows the use of a straight or curved phaco tip. The goals are to optimize cutting and minimize heat and energy,” he emphasized.

A comparison of the Whitestar System with Ozil Torsional technology (Alcon) showed that the latter had a higher measured temperature rise and the shaft itself was the primary heat source in contrast to the Ellips Transversal Ultrasound, in which the hub region was the heat source. The thermal rise at 1 second with the Ellips technology was 3.5 degrees Centigrade compared with 9.9 degrees Centigrade with the torsional procedure. In addition, the Ellips technology had an improved lens cut rate with 1.7 millimeters/second compared with 0.6 millimeter/second with the torsional procedure.

Dr. Piovela demonstrated that with the peristaltic pump the mean surgical time in 75 eyes was 15.03 minutes and with the Venturi ELLIPS FX in 79 eyes it was 14.61 minutes compared with 15.96 minutes with the Venturi ELLIPS FX 21-gauge in 84 eyes.

The **mean ultrasound time with the Venturi ELLIPS FX** was significantly shorter compared with the peristaltic pump (43.97 vs. 50.61 seconds, respectively). The **mean ultrasound time** with the venturi ELLIPS FX in 79 eyes was shorter than that with the Venturi ELLIPS FX 21-gauge in 84 eyes (43.97 vs 57.28 vs. **seconds**, respectively).

The mean effective phaco time was shorter with the Venturi ELLIPS FX 21-gauge compared with the Venturi ELLIPS FX (44.32 vs. 45.07 seconds, respectively).

The mean endothelial cell count also decreased less with the Venturi ELLIPS FX 21-gauge and the Venturi ELLIPS FX and were similar over 6 months postoperatively. Substantial reductions in the endothelial cell count were seen in the cases in which the peristaltic pump was use up to 1 year postoperatively, Dr. Piovela reported. OK?

The Whitestar System is the only system to use peristaltic and Venturi technology, which have different applications. Dr. Piovela pointed out that in phase one sculpting the peristaltic pump is used. In phase two quadrant removal, the Venturi pump is used; with premium intraocular lens implantation with a small rhexis, the peristaltic pump is used. The Venturi pump is used for epinuclear removal and for removal of an ophthalmic viscoelastic device; either pump can be used for cortex removal. “Phaco machines with double pumps permits users of the peristaltic pump to adopt Venturi pump without increasing the complication rate,” he commented.

“I am happy to have the opportunity to use a phaco machine that I have no fear using. The Whitestar System has the ability to switch to a Venturi pump depending on the different steps of my cataract surgery. This is positive feature for me, especially in cases that are extremely complicated,” Dr. Piovela stated.

Dr. Piovela is a consultant to AMO - ABBOTT.

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Take-Home Message

A comparison of the Venturi and peristaltic pumps in different phaco modalities demonstrated the superiority of a phacoemulsification system, the Whitestar Signature with ELLIPS FX Technology (Abbott Medical Optics), that incorporates both technologies.