IS YOUR MOST IMPORTANT TOOL OUTDATED?

If your phaco machine is more than a few years old, it's time to upgrade.

BY EVA LIANG, MD

Contemporary cataract surgery achieves excellent results—and has for many years. Because of this, perhaps, it is easy for surgeons to be lulled into thinking our current phaco machines are as good as they need to be. But in the past few years, all three major US phaco machine manufacturers—Alcon, Johnson & Johnson Vision, and Bausch + Lomb—have launched new or upgraded devices that have improved efficiency, especially in dense nuclei.

Some of these upgrades make quite a bit of difference. In fact, I imagine that most surgeons would appreciate the differences in speed and efficiency even on a demonstration day, when one would typically expect to be slowed down by an unfamiliar technology.

In part, the improvements are due to new features and greater ability to customize the devices. But remember, a phaco machine is essentially a computer hooked up to a device that performs highly targeted tasks for cataract extraction. Much like your new computer or smartphone works better than your old, slow, outdated one, the new phaco machines benefit from dramatic improvements in computer processing power. They think faster, so to speak, and therefore can react to changing conditions in the eye more responsively.

This article reviews what surgeons may find when they schedule those demo days for three of these new phaco platforms. (For basic information on a sampling of other phaco systems being used around the world today, see *Additional Phaco Technologies on pg 25.*)

CENTURION (ALCON)

Alcon was the first of the three companies to release a major phaco platform upgrade, when it moved from the Infiniti Vision System to the Centurion Vision System. The active fluidics of Centurion provided a vast improvement over Infiniti's abilities in mature cataracts. With the older system, it was not uncommon for the phaco tip to become clogged, forcing the surgeon to stop, pull the phaco tip out, and dislodge nuclear fragments wedged in the tip. This might occur several times in an eye with a dense nucleus, slowing down the case considerably. That does not happen with the Centurion or the other new phaco machines.

Centurion also relies on *active infusion*—variable fluid input pressure that is designed to maintain the target pressure and volume inside the eye without making adjustments to the height of the external bottle (Figure 1).

What I like most about the Centurion is the lower pitch of the footpedal. Although this might seem like a small detail, the footpedal is how we drive the machine, metaphorically speaking. Minor adjustments to the functionality or ergonomics of the footpedal can make a big impact on surgeon comfort.

The Centurion is now the oldest of the new generation of machines. The tuning time is fast, at about 20 seconds, which can shave time over the course of a day in a busy surgery center if you need to retune between or during cases. Total prime-and-tune time is similar to that of the other devices.

STELLARIS ELITE (BAUSCH + LOMB)

The Stellaris Elite is the most recently launched of the three upgrades discussed here. I use it at one of the surgery centers where I operate. It is a purely venturi system, so it is very fast and efficient. The Stellaris Elite relies on *adaptive fluidics* to combine precise aspiration control with dynamic infusion compensation, providing greater

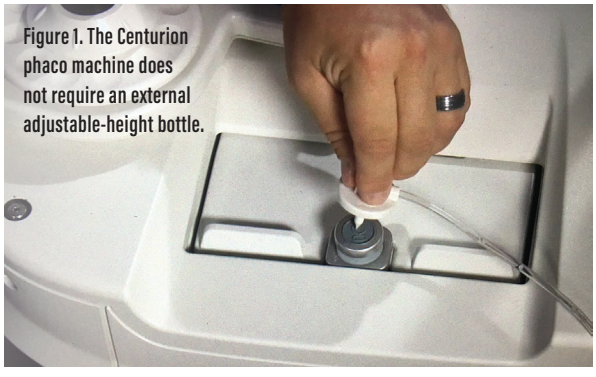


Figure 1. The Centurion phaco machine does not require an external adjustable-height bottle.

chamber stability compared with the previous generation. The prime-and-tune capability is faster, too.

Again, I would highlight the footpedal technology. The dual-linear footpedal (Figure 2) allows the surgeon to uncouple the ultrasound and fluidics, making it possible to use high vacuum but very little phaco energy, for example. This provides new opportunities for surgeons to advance their technique.

This platform also has a powerful vitrectomy cutter, making it a nice option for surgery centers where posterior segment surgery is also performed.

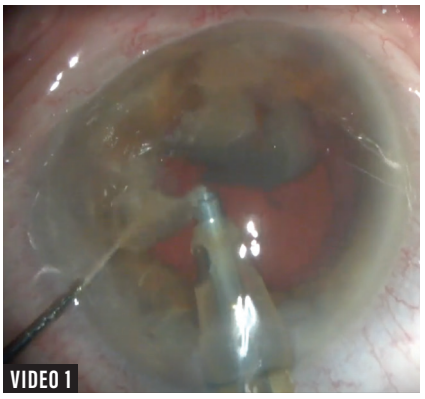
WHITESTAR SIGNATURE PRO (JOHNSON & JOHNSON VISION)

When our center upgraded to this device about a year ago, I saw the impact on case time and ultrasound use. In the past, a particularly dense cataract might require 100% more phaco time than a standard cataract—maybe even 150% more. If I happened to have several of these cases in a session, my surgery day would quickly get off schedule. With the Signature Pro, I find that even the densest nuclei take only about 20% longer than a standard case (bit.ly/liang0718V2). This leveling of case time means it no longer matters how many dense cataracts I have on a given day. I can be confident that the day will proceed smoothly and on schedule for me, my staff, and our patients.

The WhiteStar Signature system has always had *fusion fluidics* (the dual pump capability that allows surgeons to switch back and forth between venturi and peristaltic fluidics). I typically perform a modified divide-and-conquer procedure, dividing the nucleus into halves instead of quadrants. Although I mostly operate in venturi mode, if the larger pieces don't come easily to the tip, I temporarily switch pumps so that I can grab the elusive segment with the peristaltic system's greater holdability, and then go right back to venturi (bit.ly/liang0718V1).

The dual fluidics are not new, but the Signature Pro has upgraded tubing that allows higher venturi vacuum than before. It also has a faster vacuum sampling rate (every 4 ms instead of every 20 ms) and faster compensation for fluid loss, which can reduce complications and surgical time. These changes have resulted in less corneal edema and faster visual recovery in the immediate postoperative period. The wireless footpedal is also more responsive, improving its performance.

WATCH IT NOW



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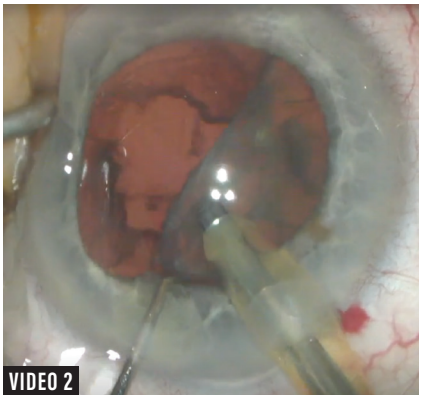

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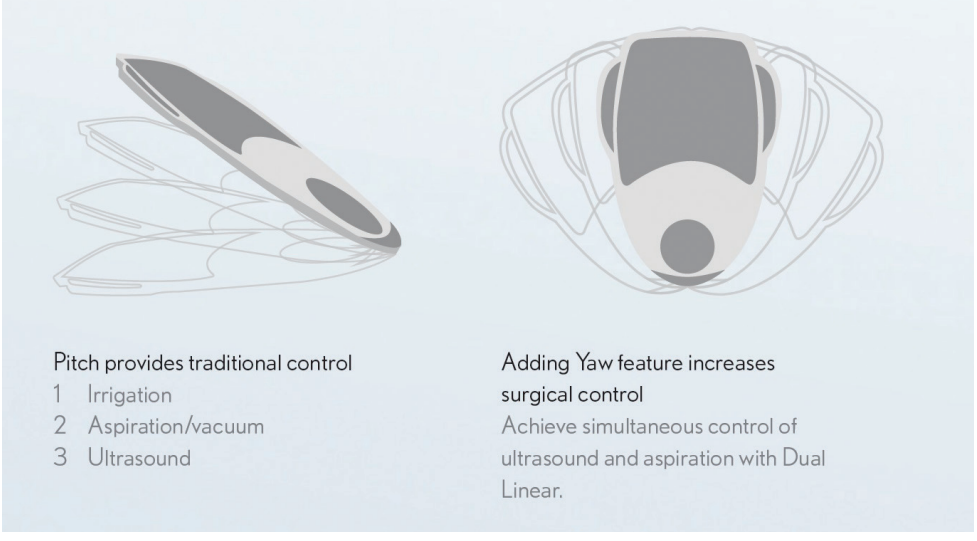

Figure 2. The Stellaris Elite has a dual-linear footpedal (left) with several interesting features, including the ability to uncouple control of the ultrasound power and fluidics (right).

ADDITIONAL PHACO TECHNOLOGIES

VISALIS 500 (CARL ZEISS MEDITEC)

The Visalis 500 incorporates Advanced Power Modulation (APM) to allow surgeons to reduce the energy entering the nucleus during phacoemulsification and to control the fluidics more effectively, according to the company. APM technology combines the benefits of the pulse and burst modes. With APM, the company states, surgeons have reported reducing phaco energy by an average of 50% and, for hard cataracts (grades 4 and 5), by as much as 73%.

Source: https://www.zeiss.com/meditec/int/media-news/press-releases/visalis-500.html

FORTAS CV-30000 (NIDEK)

With a refined peristaltic pump, the Fortas CV-30000 achieves vacuum rise at shorter times than the venturi pump, according to the company. Further, the system's Variable Intervals and Strokes software provides dual oscillation of conventional and ultrashort duration pulses, allowing nucleus removal with less energy. The Auto Pulse System Plus helps to minimize surge by automatically stopping the ultrasound and aspiration pumps immediately after occlusion breaks.

Source: http://www.nidek-intl.com/product/ophthaloptom/surgical/sur_ophthalmic/fortas.html

EVA (DUTCH OPHTHALMIC USA)

The Eva's fluid control system, Vacuflow VTi, uses valve timing intelligence to eliminate the risk of unwanted pulsation or flow during phacoemulsification, according to the company. In vacuum mode, the tissue comes to the phaco tip to facilitate faster tissue removal. This system can also be used for vitrectomy with the Eva's Two Dimensional Cutter.

Source: https://www.dorc.eu/eva

CATARHEX 3 (OERTLI)

The compact and lightweight (5kg) Catarhex 3 phacoemulsification system incorporates easyPhaco technology to ensure safe and efficient cataract removal, according to the company. The Catarhex 3 is equipped with the HF capsulotomy tip, CortexMode for safe irrigation and aspiration and precise flow, and a vacuum sensor integrated into the tubing system to ensure reliable monitoring.

Source: https://www.oertli-instruments.com/en/surgical-platforms/catarhex-3

PREPARE FOR THE CHANGE

In my opinion, anyone who is still using an older phaco machine is going to want to upgrade the first time they try one of these new-generation devices—the differences are that significant and obvious.

I encourage surgeons to demo all three devices described here. Do your homework on what features each machine offers, and be sure to schedule a range of cases for the demo day so that you get a good understanding of how the device feels in different types of cases. The manufacturer's reps should analyze your existing technique and settings in order to help you set up something similar initially. As you become more comfortable with the device, you can turn up the settings more aggressively to really put the new features to the test.

To me, the cost of a phaco machine upgrade is a reasonable investment, especially given how much we stand to gain from a new, more efficient technology. The phaco machine is one of the most crucial pieces of equipment we use in the OR. We use it all day long on surgery days, case after case. It makes sense to maximize its efficiency, both for our own benefit and that of our patients. ■

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