Automating ultrasound delivery for increased efficiency in my cataract surgeries: Power on Demand with the ZEISS QUATERA 700

Wolfram Wehner, MD

A full year has passed since the QUATERA® 700 phacoemulsification system from ZEISS was launched away from the posterior capsule, iris, and cornea. This new platform is equipped with novel technologies that in my opinion make it a state-of-the-art device raising cataract surgery safety and efficiency to higher levels.

Specifically, ZEISS QUATERA 700 features a unique pump system – the ZEISS patented QUATROPump® – that based on my personal experience provides extra-ordinary anterior chamber stability. In addition, when building ZEISS QUATERA 700, ZEISS engineers adopted my vision for automating ultrasound delivery. Tagged Power on Demand (PoD), this one-of-a-kind ultrasound management technology regulates ultrasound upon occlusion and deactivates it when there is no occlusion so that energy is used only when needed for lens emulsification (FIGURE 1).

With most other phacoemulsification systems today, air pressure in the bottle is increased via the overflow vessel, and this total pressure must safely compensate for the maximum suction rate. In my experience, this design leads to an increase in IOP when there is no suction. On the other hand, because these systems are set for a certain incision size and do not compensate for fluctuating incision leakage, I have found that the anterior chamber collapses at maximum suction if the incision turns out to be somewhat larger than planned. These situations are eliminated when I am using the ZEISS QUATERA 700.

With its real-time measurement of aspiration volume, ZEISS QUATERA 700 can easily detect upcoming occlusion. This information is used to enable PoD.

What was the genesis of your idea for PoD?

There has been an ongoing evolution in phacoemulsification techniques and technologies driven by aims to continue to improve safety and efficacy. In addition to maintaining a stable anterior chamber, the safety and efficacy of modern cataract surgery is tied to the amount of ultrasound energy delivered during the procedure. Minimizing ultrasound energy consumption results in less postoperative corneal edema and macular edema, which translates into faster visual recovery, and it is also associated with less corneal endothelial cell loss. One key to minimizing ultrasound energy consumption is to use phaco power only when it is needed, and that is when the aspiration port is blocked with lens material. However, when surgeons are working to control ultrasound manually using the foot pedal, it is difficult to switch the power on and off precisely as needed. Consequently, I felt that I was using more than the minimally necessary phaco power because I would activate ultrasound before it was needed and keep the foot pedal depressed when phaco was no longer needed.

The need to simultaneously concentrate on what was happening inside the eye and respond appropriately with the foot pedal also added to my stress during surgery.

Automated ultrasound PoD was my idea for addressing these issues. The concept is to have a system where ultrasound turns on automatically when aspiration fluid flow stops because the aspiration port is blocked with a lens fragment and then turns off immediately once the port is open. Because phaco energy reaps lens fragments, PoD that activates ultrasound only upon occlusion also leads to higher followability in my surgeries.

How are you using PoD?

I like to operate with high vacuum because I feel it reduces surgical time and increases efficiency. Because the QUATROPump works so well to maintain anterior chamber stability, I feel confident operating with the maximum vacuum, while still being available on power on demand. Instead I only have to concentrate on bringing lens fragments to the aspiration port.

Do you have any advice for surgeons as they begin to use PoD?

First, I would repeat to my peers that I expect they will have a short learning curve for using PoD. I believe that surgeons should feel comfortable after just 10 to 15 cases. Based on my experience with the technology, I would also reassure surgeons not to worry that using PoD will compromise safety. Because of ZEISS QUATERA 700’s fluids system, surgeons can keep the phaco tip in the center of the anterior chamber without the concern of phaco aspirating into the lens fragments to block the aspiration port with lens material. However, I would recommend using high vacuum and high aspiration flow because those settings allow occlusion to build more quickly and therefore can enable surgeons to experience the greatest benefits of PoD.

Does PoD affect total procedure time?

Once surgeons complete what I believe will be a quick learning curve for PoD, I expect they will find that the operation time using PoD will be the same or shorter than for similar cases done without it. In my surgeries, PoD can help reduce the total procedure time because it allows me to concentrate better on directing lens fragments to the phaco tip.

What differences has using PoD made for your patients and for you as a surgeon?

So far, my experience with PoD includes approximately 200 cases, and I found that the effective phaco time was significantly lower compared to procedures done without PoD. I also noted that the eyes operated on with ZEISS QUATERA 700 using PoD had clearer corneas on postop day 1, and the percentage of eyes with 20/20 vision was higher too. For me, PoD definitely makes my surgical days less stressful because it frees me from having to think about turning phaco on and off.

Do you have any advice for surgeons as they begin to use PoD?

First, I would repeat to my peers that I expect they will have a short learning curve for using PoD. I believe that surgeons should feel comfortable after just 10 to 15 cases. Based on my experience with the technology, I would also reassure surgeons not to worry that using PoD will compromise safety. Because of ZEISS QUATERA 700’s fluids system, surgeons can keep the phaco tip in the center of the anterior chamber without the concern of phaco aspirating into the lens fragments to block the aspiration port with lens material. However, I would recommend using high vacuum and high aspiration flow because those settings allow occlusion to build more quickly and therefore can enable surgeons to experience the greatest benefits of PoD.

Regarding case studies, I offer the following experience:

When building ZEISS QUATERA 700, ZEISS engineers adopted my vision for automating ultrasound delivery. Tagged Power on Demand (PoD), this one-of-a-kind ultrasound management technology activates ultrasound on occlusion and deactivates it when there is no occlusion so that energy is used only when needed for lens emulsification (FIGURE 2).