correspondence

400 mm Hg High-Vacuum Bimanual Phaco Attainable with the Staar Cruise Control Device

Cold phaco technologies such as WhiteStar (AMO) have solved the problem of incisional burn from a sleeveless, bare phaco needle.[1,2] This development, along with the prospect of ultrasmall-incision intraocular lenses, has led to a growing interest in bimanual phaco instrumentation and techniques.[3–6] While new ultrasound power modulations permit elimination of the coaxial infusion sleeve, this has resulted in reduced irrigation inflow and greater difficulty with chamber maintenance. Compared with coaxial phaco, fluidics and chamber stability in bimanual phaco continue to be an issue with 20-gauge instrumentation.

Several strategies have been adopted to improve chamber stability. To achieve tight incisions, microkeratomes that produce exact, reproducible 1.0 mm or 1.2 mm incisions have been developed. Other strategies have focused on increasing irrigation inflow using a separate chamber maintainer or pole extenders for added bottle height. Microsurgical Technologies has developed an irrigating chopper shaft that can be used with interchangeable tips and delivers 40 cc/minute of irrigation at a bottle height of 30 inches. Others have tried pressurized infusion systems available with combined anterior–posterior segment machines or through the use of a modified air pump.[7] Nevertheless, it is often necessary with bimanual phaco to work at a much lower aspiration flow and vacuum settings comparable to coaxial phaco with the same machine.

Until recently, no technology addressed the aspiration side of the bimanual fluidic equation. In May 2003, Staar Surgical introduced an aspiration flow-restricting device called Cruise Control. This disposable product is compatible with the standard tubing set of any phaco machine and is designed to reduce postocclusion surge. The device consists of a 2 cm flow-restricting segment with a 0.3 mm internal lumen. It is positioned behind a mesh filter that traps emulsified nuclear material before it can clog the flow restrictor.

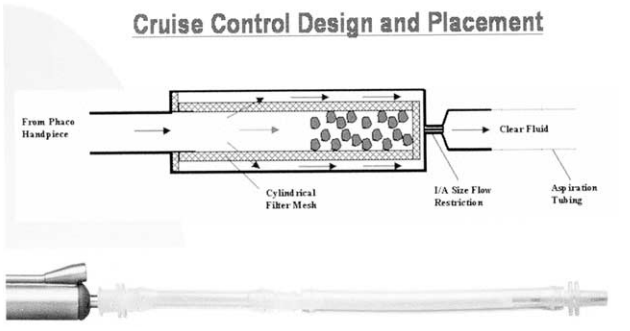

Figure 1. (Chang) Schematic of the Staar Cruise Control Flow Limiter (courtesy of Staar Surgical).

In standard phaco aspiration systems, the shaft of the phaco needle, which has the narrowest caliber lumen, determines flow resistance. Thus, using a smaller gauge phaco needle can decrease postocclusion surge. However, a smaller diameter phaco tip opening reduces holding power for any given vacuum level. Flared phaco tips are designed to further restrict flow by narrowing the needle shaft while maintaining the same diameter tip opening. This reduces surge without sacrificing holding power.

Flared phaco tips are not suitable for 1.0 mm microincisions. Additionally, the flared needle design is prone to internal clogging at the bottleneck. By using a much narrower lumen and trapping nuclear material that is emulsified ahead of the flow-restricting segment, the Cruise Control device can reduce surge without clogging or decreasing the size and holding power of the tip. Because of its length and lumen size, the Cruise Control design achieves nonlinear flow restriction. It starts to limit aspiration flow rates when they reach 50 to 60 cc/minute and has no effect on flow rates below this level. After an occlusion break at a vacuum of 400 mm Hg, surge flow can momentarily reach 200 to 300 cc/minute without this device.

The Cruise Control was designed to reduce postocclusion surge with standard phaco instrumentation. However, its ideal application is with bimanual phaco, in which more limited irrigation inflow has otherwise prevented the safe use of high vacuum settings from surge. I have used this device in 35 consecutive bimanual phaco cases with the 20-gauge irrigating Chang hori-

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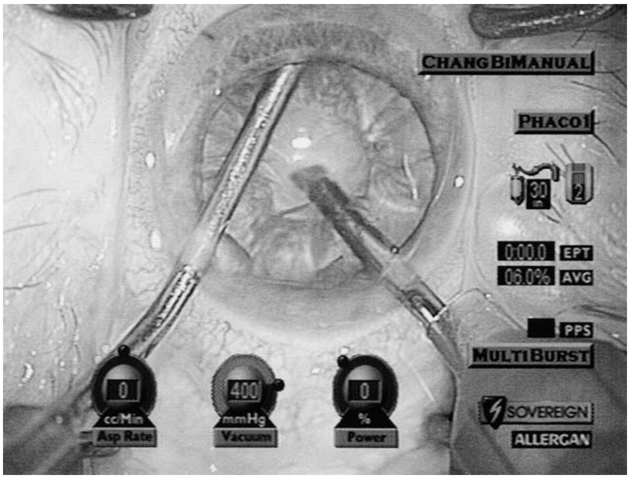

Figure 2. (Chang) High vacuum (400 mm Hg) bimanual phaco chop using 20-gauge instrumentation with Cruise Control.

zontal chopper (Microsurgical Technologies) and the Sovereign® unit and the WhiteStar machine (AMO) with a 30-degree, 20-gauge phaco tip. With the Cruise Control and a 26 cc/minute aspiration flow rate, excellent chamber stability was maintained at a maximum vacuum setting of 400 mm Hg. This vacuum level provided excellent holding power and control for phaco chop when compared with more typical settings of 250 mm Hg or less without Cruise Control.

This simple disposable device represents an advance in bimanual phaco fluidics. Along with improved irrigating chopper designs, it has narrowed the gap in fluidic performance between bimanual and coaxial phaco systems.

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Anterior Vented Gas Forced Infusion System of the Accurus Surgical System in Phakonit

Phakonit (microincision cataract surgery [MICS]) has reduced the incision size for phacoemulsification.[1–6] It is a minimally invasive technique with astigmatic neutrality and faster visual rehabilitation than traditional phacoemulsification. Advances in the material and design of micro intraocular lenses (IOLs)[6] and safer phacoemulsification with sleeveless tips are furthering the concept.

Since the early days of phakonit, anterior chamber maintenance has been a problem. The diameter of the irrigation choppers is smaller than the traditional irrigation sleeve of the phaco machine handpieces. The amount of fluid that reaches the anterior chamber is far less than in traditional phaco. To solve this, Agarwal and coauthors[4] developed an active infusion system by using an air pump. According to them, separation of the irrigation and aspiration lines is not enough to perform phakonit. This mechanical system makes the procedure hard to reproduce because each surgeon using it must build the infusion pump system. Alió has also worked frequently with this technique and reports that some features of the Accurus® Surgical System (Alcon, Inc.) are good for performing MICS, including the 0.9 mm microtip (small diameter) with polymer coating, which helps avoid thermal burns to the cornea (J. Alió, MD, personal communication, March 2003).

I started to use the Accurus Surgical System Anterior Vented Gas Forced Infusion System (AVGFI) to better manage anterior chamber fluctuations in phakonit (MICS). Incorporated in the Accurus machine, the AVGFI creates positive infusion pressure inside the eye. It was designed to control intraocular pressure (IOP) during posterior segment surgery and consists of an air pump and a regulator inside the machine. The air is pushed inside the bottle of intraocular solution, and