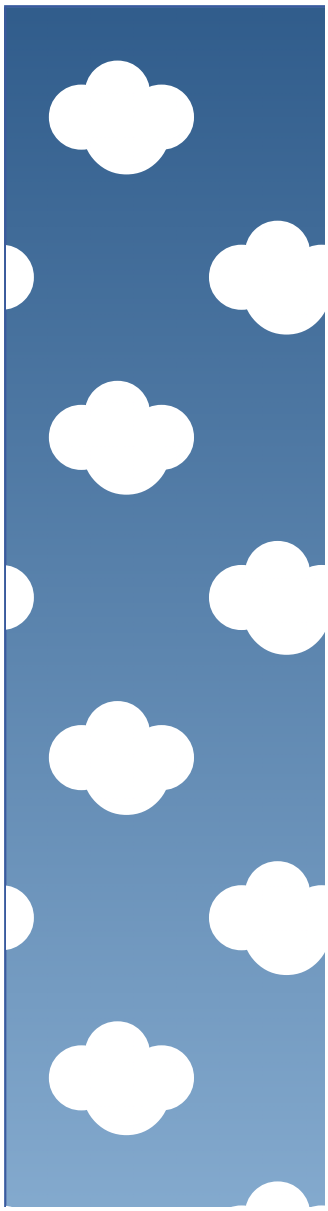

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The Hypersonic Principle

A closer look at 'the first major vitreous removal innovation in 40 years.'

Richard Mark Kirkner

NOVEMBER 8, 2017

With the launch of its Stellaris Elite system for retina surgery with the Vitesse vitrectomy system, Bausch + Lomb claims it to be the "first and only hypersonic, 100-percent open-port vitrectomy system," and the "first major vitreous removal innovation in 40 years."

What is hypersonic vitrectomy and how does it differ from the existing platforms out there? Paulo Stanga, MD, who worked with B+L in developing the Vitesse system, offers some answers to that question. Dr. Stanga is a professor of at theUniversity of Manchester in the United Kingdom, a vitreoretinal surgeon for the Manchester Royal

Eye Hospital and director of the Manchester Vision and Regeneration Lab.

He notes that existing vitrectors use guillotine-based cutters, and are either mechanically, electrically or air driven. They work by first aspirating vitreous fibers and then cutting them once they are in the vitrector needle. "Therefore, the vitreous fibers are cut only after they have been pulled from the posterior cavity into the inside of the needle port and traction has been exerted on the retina," Dr. Stanga says.

Smaller-gauge needles mean reductions in flow volumes. Some systems compensate by increasing cut rates, which causes flow volume to drop further. "However, there are limitations: speed of the cutter blade, duty cycle and turbulence within the probe," Dr. Stanga says.

Vitreous Liquefaction

The hypersonic system liquefies the vitreous and the cutting process takes place before vitreous fibers enter the port. "In addition, it achieves a much higher cut rate than guillotine-based cutters without compromising on duty cycle or flow," he says.

He explains that the hypersonic vitrector tip pulsates at 1.7 million times a minute, driving fluid through the port at its end. "An 'active zone' develops only in front of the port: within this zone, a sheer cross-flow of fluid and vitreous develops and that breaks up the collagen fibers in the vitreous into very small pieces, effectively liquefying it," Dr. Stanga says.

Guillotine vs. Hypersonic

Dr. Stanga has done comparative studies of the guillotine-based and hypersonic vitrectors in water and vitreous. "Guillotine vitrector performance is dependent on cut rate, vacuum and gauge, both in water and vitreous," he says. "However, performance of the hypersonic vitrector is dependent only on vacuum and flow for both fluids and ultrasonic power for vitreous flow, therefore allowing for the use of smaller gauges and port sizes, as well as providing less variation in flow and consequently more stable infusion pressures."

The hypersonic vitrector is capable of operating with port openings as small as 200 to 250 µm compared to 500 to 600 µm with guillotine vitrectors. "Because force is the product of vacuum and area, the hypersonic vitrector exerts less traction," he says.

The device can also work at a lower vacuum level than guillotine vitrectors because of the small and fixed open port and the fact that it is drawing in liquefied vitreous. "Lower vacuum also means less traction," he says. "A permanently open port with no resulting variations in flow leads to reduced intraocular turbulence. All of this, could make the removal of vitreous safer, especially when working close to the retina."

How a Case Proceeds

For the surgeon, a case using a hypersonic vitrector begins like one with a guillotine vitrector, but the system settings are different. "A stroke amplitude is selected instead of a cut rate, and the aspiration vacuum setting may be much lower," Dr. Stanga says. He adds that the hypersonic technology allows for the removal of vitreous, dense hemorrhage, soft lens material and silicone oil as well as the execution of a retinectomy using the same probe. "This is quite unique," says Dr. Stanga.

A first-in-human study of hypersonic vitrectomy suggests it is a promising alternative to guillotine platforms, and operating times appear to be similar or shorter with the hypersonic instrument. "The hypersonic vitrector was effective in vitreous removal in all cases, although larger-scale studies are required to confirm our initial findings," Dr. Stanga says. RS