

YAG Laser Vitreolysis for the Treatment of Floaters

Featuring insight from Cees van der Windt, MD, Rivierenland Hospital, Tiel, Holland

Virtually every individual has experienced or will experience the visual shadows caused by floaters during their lifetime. For most, this event is a minor and short-lived inconvenience, but for a select few, it can be a disabling condition. Floaters are small bundles of collagen fibers located in the eye's vitreous and they are a known product of degenerative vitreous syndrome (DVS; the natural breakdown and clumping of collagen in the vitreous) and posterior vitreous detachment (PVD; the age-related separation of the vitreous from the retina).¹

Introduction

Although notoriously bothersome, floaters typically resolve within weeks or months of appearing. In some cases, however, they persist for much longer.² When floaters persist or are present at disabling levels; removal of the vitreous humor (vitrectomy) is considered a viable treatment option. However, it is a highly invasive procedure that carries a significant risk of complications, such as infection, retinal detachment, macular edema, anterior vitreous detachment and residual floaters.³ With this in mind, clinicians are often reluctant to offer patients a vitrectomy and instead advocate perseverance, safe in the knowledge that most patients grow used to the presence of floaters with time.³

But in postoperative cataract surgery patients (where improved visual clarity following surgery increases the awareness of pre-existing floaters), individuals with low tolerance of

visual obscurations and those with particularly vision-dependent occupations, the perseverance approach is unsatisfactory.⁴ Anecdotally, highly-active men, long-distance drivers and post-cataract surgery patients implanted with multifocal IOLs find the presence of floaters more disabling than other individuals, especially at night when the pupil is maximally dilated.

There is an effective outpatient-based treatment that is anecdotally reported to provide a solution in up to 70% of these cases. However, adoption of this procedure has been limited by so far unaddressed technology-related complications and limited physician and patient awareness of the procedure.

A Possible Solution For A Common Problem

The treatment in question is neodymium-doped, yttrium aluminum garnet (Nd:YAG)-laser vitreolysis and can be carried out with the Ultra Q™ microsurgical Nd:YAG-laser (Ellex Medical Lasers, Australia, www.ellex.com) to produce highly effective results. The best results are reported to occur in IOL-implanted patients: the very same patients that most commonly request floater removal. By convention, Nd:YAG lasers emit high-power density and the use of these lasers to vaporize structures as small as floaters can be challenging, due to the potential risk of damage to surrounding ocular tissue. Additional complications, such as raised intraocular pressure and retinal damage or detachment, can also occur secondary to high-energy laser application within the vitreous and pose additional safety concerns that ultimately limit procedural uptake.

The Ultra Q™ laser has been developed as an effective solution to these concerns. The proprietary cavity design of the Ultra Q™ produces an Ultra Gaussian pulse, teamed with a fast pulse rise time. This technology enables the Ultra Q™ to achieve optical breakdown (using a plasma spark to produce a shockwave, which then incises the tissue) at lower energy levels and with fewer shots than other laser systems. Indeed, the Ultra Q™ achieves ultra-low energy optical breakdown (in air) of approximately 1.8 mJ in optimal conditions, compared with other Q-switched YAG lasers that typically achieve optical breakdown (in air) at 3 to 4 mJ. Designed to deliver 400,000 laser shots with sustained long-term performance, the Ultra Q™ avoids the time-related deterioration of laser-pulse delivery often experienced with other Q-switched YAG lasers.

In addition, its two-point focusing system maximizes the precision of application, ensuring that only the intended photodisruption target is hit.

Reflex Technology™ (Ellex, Adelaide, Australia, www.ellex.com), is the latest addition to the Ultra Q™. This cutting-edge light delivery system reduces the risk of collateral ocular tissue damage associated with Nd:YAG laser-based floater treatment by maximizing vitreous illumination. Usability of conventional YAG lasers is often compromised by the limited view of the vitreous provided by these devices. As such, physicians can struggle to identify and focus on the targeted floaters and membranes. Furthermore, if the slit generator on these systems is used in a coaxial position, the mirror which reflects the illumination beam has to be

positioned in the path of the treatment beam. This results in clipping of the laser beam and ultimately leads to a reduction in the amount of energy delivered, particularly deeper in the vitreous where more energy may be required. Designed to overcome this limitation, the proprietary slit lamp illumination tower design of Ellex's Reflex Technology™ offers perfect visual coaxiality by converging user vision, target illumination and the treatment beam focal plain along the same optical path and in focus in the same plane. Coaxial illumination is further made possible by the system's retractable reflecting mirror, which is designed to move out of the laser's pathway during firing mode.

Although initially designed for conventional photodisruption procedures, such as posterior capsulotomy (after cataract surgery) and laser iridotomy (to relieve anterior chamber pressure), the Ultra Q™ laser's industry-leading specifications and design make it suitable for the treatment of vitreous floaters. By delivering short bursts of energy into the eye, the laser is able to break up collagen fibers in troublesome floaters in a much quicker and less invasive procedure than conventional vitrectomy. And if the improvement is not sufficient, retreatment or recourse to vitrectomy is still possible at a later date.

Laser Vitreolysis Study

In a Dutch study performed by Cees van der Windt, MD, and colleagues, 100 eyes with PVD-related floaters persisting for more than nine months were treated with YAG-laser vitreolysis (n=65) or pars plana



Ultra Q™ Microsurgical YAG Laser

vitrectomy (n=35). After all eyes were treated, both the YAG and vitrectomy groups reported an improvement in vision at 85% and 90% respectively. Furthermore, over a follow-up period of eight years, no complications were observed among YAG-treated patients.

These findings echo those of two small-scale studies carried out by Tsai, et al, and Toczolowski, et al, in the 1990s. In both studies, a near 100% rate of floater removal was achieved with Nd:YAG laser vitreolysis and no intra- or postoperative complications occurred in any patient.^{5,6}

Boosting Patient Confidence In Physicians

The patient who complains repeatedly of the benign and common occurrence of floaters is a challenge for any eye specialist. Unable to see through his or her patient's eyes, the specialist can easily underestimate the true impact of PVD-related floaters on a patient's quality of life. The absence of a safe and effective treatment for floaters only exacerbates the feeling of being ignored that such patients experience when they approach their physician for a solution to their problem. With a growing pool of evidence in support of the safety and efficacy of Nd:YAG laser vitreolysis, the Ultra Q™ laser marks a new era in the management of persistent floaters.

The Ultra Q™ laser does not aim to become a universal panacea for floaters; such a one-size-fits-all approach would be unnecessary for a condition known to usually resolve

without any intervention. However, Ellex believes that among the specific group of patients for whom the 'wait and see' approach does not work, treatment with the Ultra Q™ laser may well provide some much-needed light at the end of the tunnel. Increasing awareness of this tool and facilitating user education is the next step in ensuring that this non-invasive outpatient procedure reaches the patients who need it the most.



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