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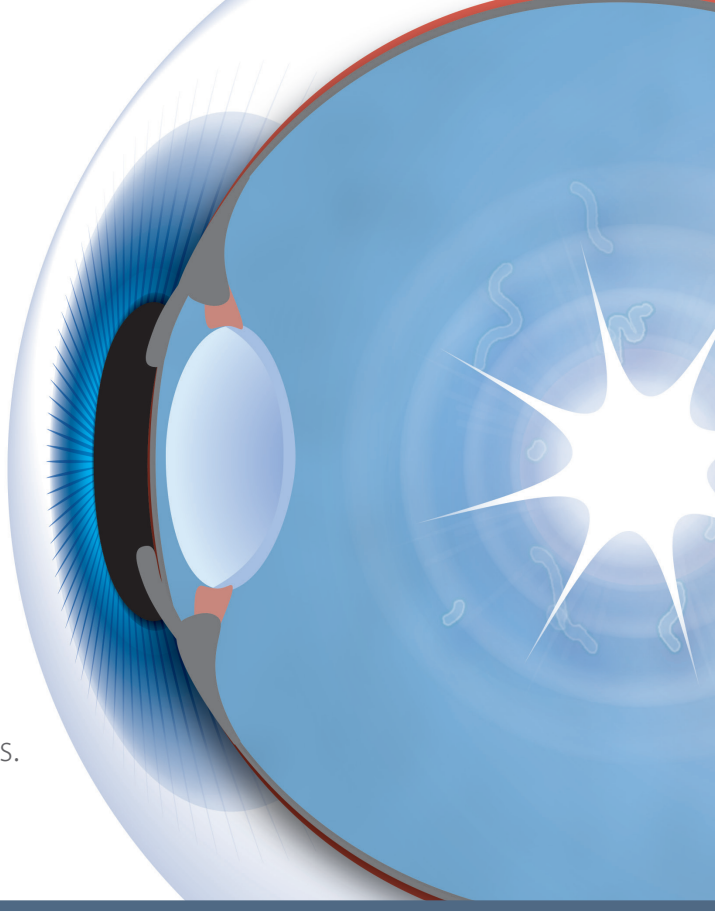

A SIMPLE SOLUTION TO A VERY REAL PROBLEM

Ophthalmologists are successfully using laser vitreolysis to treat patients with symptomatic floaters.

BY KARL BRASSE, MD, MRCOPHTH; INDER PAUL SINGH, MD; AND KARL G. STONECIPHER, MD

The negative effect that floaters can have on a patient's quality of life has traditionally been largely underestimated. In symptomatic patients, floaters can drastically impede vision, so much so that they not only affect visual quality and functioning but can also have a psychological impact.[1,2]

In the past, vitrectomy has been commonly considered the gold standard for the treatment of debilitating floater symptoms. Due to the risk of complications associated with the procedure—infection, macular edema, and retinal detachment[3,4]—many ophthalmologists were reluctant to perform vitrectomy and instead reserved it for only the most severe and distressing cases.

With the introduction of the Ultra Q Reflex multimodality YAG laser (Ellex; Australia), the first and only laser designed specifically for posterior and anterior YAG laser procedures, ophthalmologists can offer their symptomatic floater patients treatment with laser vitreolysis, aka Laser Floater Removal (LFR), with greater safety and efficacy than ever before.[5]

Compared with its early clinical use in the 1980s, modern LFR performed with the Ultra Q Reflex provides more efficient and safer energy profiles, offering reliable and repeatable outcomes that provide a low rate of complications combined with a high degree of patient satisfaction.[5]

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> **—Inder Paul Singh, MD**

LFR involves the use of a nanopulsed ophthalmic YAG laser to vaporize vitreous strands and opacities and does not carry the same risks of infection, bleeding, or retinal detachment that comes with vitrectomy.[3,4] During the procedure, the laser emits a short (3 nanoseconds) and small (8 microns) burst of energy at a potent power density (109 J/cm^2). This energy converts the collagen and hyaluronic molecules found in a floater into a gas, which is then resorbed into the eye.

Karl Brasse, MD, MRCOphth; Inder Paul Singh, MD; and Karl G. Stonecipher, MD, share their experiences of LFR using the Ultra Q Reflex laser.

AN UNMET NEED

Karl Brasse, MD, MRCOphth: Before introducing LFR into my clinics I could not offer much to help patients

with floaters. I found it a difficult process to tell patients they would have to continue living with their floaters. Alongside an occupational psychotherapist, I could only offer simple psycho-visual strategies, such as the use of tinted glasses (as enlarged pupils make floaters less obvious), changing white backgrounds to grey or black, and using diffuse structure computer screens. The situation had become increasingly frustrating for both my patients and me, and I was hesitant to offer pars plana vitrectomy for these symptoms, as up to 90% of cases result in postoperative cataract.[6]

Inder Paul Singh, MD: Whether patients with symptomatic floaters should be offered treatment or told to "carry on regardless" continues to be debated. One thing is for certain: more patients are complaining of floaters and the impact they have on their quality of life. Until I started performing this procedure, I did not fully understand the impact they have on patients' daily life. A study of 603 smartphone users by Webb and colleagues found that an overwhelming 76% (n=458) noticed floaters; of these patients, 199 had noticeable vision impairment.[7] Furthermore, myopes and hyperopes were 3.5 and 4.4 times, respectively, more likely to report moderate to severe floaters.[7] This study highlights quite clearly that floaters are very common in the general population, irrespective of age, race, gender, and eye color.

Karl G. Stonecipher, MD: Although floaters may be a mild and short-lived inconvenience for most patients, there is nevertheless a sizeable minority for whom the problem is far more serious. One recent survey by Wagle and colleagues found that the deleterious impact of floaters on individuals' quality of life was comparable to or worse than that of age-related macular degeneration, diabetic retinopathy, or glaucoma.[8] Floaters are often easy to overlook as a common symptom of vitreous deterioration, but if they have a significant adverse impact on a patient's quality of life, then treatment is often warranted.

CHANGING ATTITUDES WITH CHANGING TECHNOLOGY

Dr. Stonecipher: For many, if not most, of my refractive surgery colleagues, the idea of treating floaters with a YAG laser was taboo. They felt it was crossing a line, that these were healthy eyes that did not require surgical intervention, and that the risks outweighed any potential benefits. I understood and even shared some of their skepticism, but I felt that we owed it to our patients to offer them something more than a sympathetic ear when they explained the negative impact of floaters on their quality of life. LFR has since become a positive addition to my busy practice. The bottom line is that, in my experience, the procedure is safe, effective, and painless, and it has enabled scores of patients to achieve functional improvements in their vision and greatly improved their quality of life in the process.

> "Doctors are now beginning to grasp the potential benefits of using different energy profiles and visualization systems to make treatment of floaters possible."
> —Inder Paul Singh, MD

Dr. Singh: I have been privy firsthand to the changes in how our profession perceives LFR. On one hand, the poor historical data and the fact that many consider LFR beyond their comfort zone (because it does not follow traditional conventions and is not taught in medical schools and residency programs) has led to initial pushback. On the other hand, patients and ophthalmologists are becoming increasingly aware of LFR and the new technology, which is triggering growing acceptance of the potential benefits of LFR. Although it is still considered novel and "outside of the box" to apply a different use to something as familiar as a YAG laser, doctors are now beginning to grasp the potential benefits of using different energy profiles and visualization systems to make treatment of floaters possible.

Dr. Brasse: Modern LFR is a different procedure. It is not the same procedure as in past years. Earlier attempts at LFR were not always positive, because the technology was not optimized. Previous generations of YAG lasers had larger spot sizes that did not allow the plasma burst to be as tightly focused, so LFR was more difficult with the older lasers. The optical breakdown and small convergence zone created by the Ultra Q Reflex laser minimizes plasma movement and energy levels needed for ablation.

IS LASER VITREOLYSIS FOR EVERYONE?

Dr. Singh: In my experience, the success of LFR depends on the ease of visualization, type, size, and location of the floater, as this will determine the energy and number of shots required. Typically, floaters in the mid to posterior face of the vitreous will require higher energy and more shots to vaporize than smaller anterior floaters. This also reduces any associated risks of lens pitting or damage that can be associated with the procedure. As confidence with the procedure grows with

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> —Karl Brasse, MD, MRCOphth

better understanding of the visualization abilities of the laser, and treatment plans are tailored according to the type of floater, physicians can provide a solution for smaller or larger diffuse amorphous floaters, rather than limiting treatment to classic Weiss rings and large solitary floaters. It is important to note, however, that LFR is not 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. I firmly believe, however, for the specific group of patients for whom the wait-and-see approach does not work, LFR can provide some much-needed relief. A retrospective observational study performed within my practice and presented at the 2015 American Academy of Ophthalmology meeting and 2016 American Society of Cataract and Refractive Surgeons meeting involved 296 eyes of 198 patients aged 38 to 89 years and revealed a 93% satisfaction rate following LFR.[9] This high satisfaction rate has driven up my practice's patient numbers, referral rates, overall profitability, and staff morale.

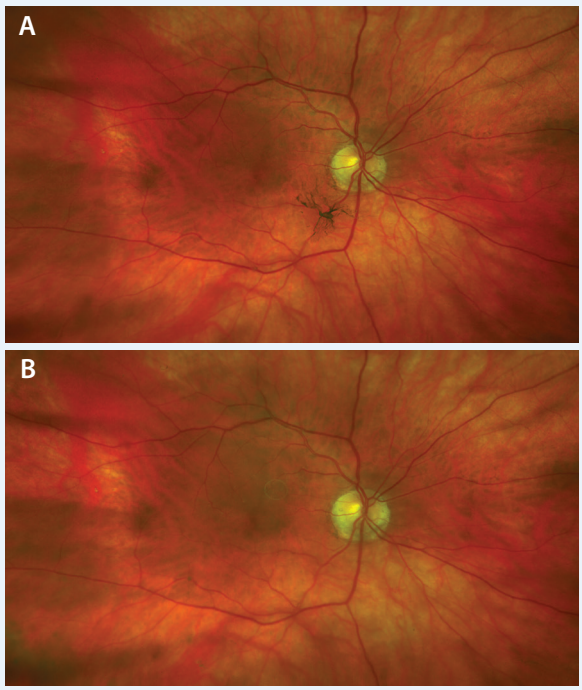
Dr. Stonecipher: Patient selection is key. I find that LFR works extremely well for, but not necessarily limited to, Weiss-ring opacities caused by posterior vitreous detachment. Because these vitreous strands/opacities are fibrous, they absorb the laser energy well and can be vaporized more efficiently. In addition, they are usually located within the midvitreous, so are a safe distance away from the crystalline lens and the retina. The best results are reported to occur in IOL-implanted patients: the very same patients that most commonly request floater removal. In my experience, it is often postoperative cataract surgery patients who find the presence of floaters more disabling than other individuals, because improved visual clarity following surgery increases the awareness of pre-existing floaters.

Dr. Brasse: Between my two practices, I see approximately 300 to 400 outpatients a week and have 20 to 30 new patients each week, comprised of self-referrals or second-opinion cases. Of these new patients, 90% have floaters and roughly 10% of those are symptomatic. Many, if not all, of these patients are suitable for treatment with LFR. I have noted a commonality among this group; these are usually patients who require fine detailed vision and, therefore, notice floaters more and suffer throughout their working day. Even though I am not able to treat everyone, in those whom I can treat, there is an overall feeling of success and satisfaction (Figure).

I conducted a simple study of my first 100 cases, treated between November 2013 and December 2014. These patients had experienced symptomatic floaters for 6 months or more. Over a 10-month follow-up period, these patients noticed a 78% improvement in symptoms and quality of life suggesting that, with good selection of patients, the procedure is safe and gratifying for both patient and surgeon alike.

TECHNOLOGY IN FOCUS

Dr. Brasse: I strongly believe that the success I have encountered with LFR is due to the system that I use. I believe that having perfect coaxial illumination—ie, all six beams in line (one slit lamp illumination, two slit lamp observations, two Helium neon-aiming beams, and the infrared treatment beam)—make for superior visualization and treatment. This is in contrast to standard YAG laser systems, where the illumination beam comes from below the observation and treatment beams, meaning that posterior vitreous treatment



(Courtesy of Karl Brasse, MD, MRCOphth.)

Figure. A patient before treatment with LFR (A) and after treatment with LFR (B).

is not possible. Historically, using standard YAG laser systems, the clinician could not see the middle and posterior vitreous.

Dr. Singh: Traditional YAG lasers typically have larger and less-controlled plasma with more inconsistent power output. Because it can be difficult to focus and visualize on small structures—such as vitreous strands—collateral ocular tissue damage may occur if one does not have correct spatial context, ie where the floater is located in relation to the retina and the correct plasma formation. In contrast, the Ultra Q Reflex features an ultra-Gaussian 3 nanosecond beam mode teamed with a fast-pulse rise time and a small spot size, meaning that with a higher power density and tightly controlled plasma, fewer shots are required to perform procedures with less cumulative energy delivered to the patient.[5] The short pulse does not allow time for heat or energy to build in the eye despite a large number of shots. It is noted that the growth of plasma as a function of power is a LOG law phenomenon, for instance, the increase in size of plasma between 4 to 12 mJ is modest (<50%). In short, this new laser can vaporize floaters using a lower energy level than other Nd:YAG lasers. Furthermore, the system incorporates a proprietary slit lamp illumination tower design, which converges the operator's vision, the target illumination, and the treatment beam along the same optical path and onto the same optical plane. The illumination tower can be used coaxially to enhance the view of the target opacity. A surgeon needs to be able to see where the retina is to obtain much-needed spatial context. If you view the vitreous and notice that both the floater and the retina are in focus, you are too close to the retina. If the floater is in focus but the retina is not in focus, you can feel confident you have enough spatial context to fire the laser without damaging the retina. This visualization is only achieved with coaxial illumination. The laser can also fire in the oblique position (noncoaxial) position like standard lasers, thus giving good spatial context for anterior floaters that may reside behind the phakic lens. The ability to titrate the amount of coaxial illumination is a key feature of this new laser that has enhanced the efficacy and safety of LFR.[5]

Dr. Stonecipher: I have been working with laser platforms since I was a student in the 1980s, and I was always intrigued by the potential of using lasers to treat floaters. It was only when Ellex started working on the problem and developed a YAG laser that was capable of performing LFR with greater efficacy and an improved safety profile compared with a conventional YAG laser that I thought this approach might be useful in my practice. Specifically, the system minimizes the potential for focusing errors and reduces the risk of damage to the natural lens or the retina.[5] There is no risk of underdoing or overdosing the energy due to poor positioning of the illumination tower. The precision of the two-point aiming system and the wide offset range ensure accurate positioning of the optical breakdown, thus further protecting surrounding tissue from accidental damage.

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CONCLUSION

Indeed, advances in YAG laser technology, including coaxial visualization and the ability to titrate axis illumination, has literally taken LFR from a rudimentary and potentially risky treatment option to one that has transformed the lives of many patients with a high degree of safety and efficacy. It is clear that LFR is set to become a popular procedure within ophthalmology practices. Given the impact of symptomatic floaters on daily life, this change is one that will be greatly welcomed by affected patients and the doctors treating them. ■

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