YAG laser offers safe option for floaters by John R. Karickhoff, MD

Vitreous opacities are almost universal, and most need no treatment. However, larger floaters, as well as those in the mid- or posterior vitreous, frequently cause difficulty in reading, driving, computer usage and concentration. Because laser treatment of floaters is almost unknown, these floater patients are told to “learn to live with it” and that vitrectomy is the only treatment. But vitrectomy is rarely recommended because of the high risk of cataract formation and a 1% to 3% risk of retinal detachment. The result is that symptomatic floater patients rarely receive treatment.

Fortunately, vitrectomy is not the only treatment for floaters. The YAG laser offers a revolutionary, effective and safe way to treat such patients.

Advantages

YAG laser obliteration of vitreous floaters has these advantages:

- It is much safer and less expensive than vitrectomy;
- It removes the floater, not the vitreous;
- It is a 20 to 40 minute office procedure using topical anesthesia;
- There are no restrictions on activities, and patient has full recovery within 24 hours;
- It is effective in 92% of cases;
- It had zero significant complications in our Institutional Review Board/Food and Drug Administration supervised 200-patient study;
- The eye is not opened (no cataract formation, retinal detachments, infections or bleeding);
- It uses equipment to which ophthalmologists already have easy access.

Misconceptions

When doctors first learn of this procedure, they almost always have four misconceptions. First, they mistakenly believe that vitreous opacities are not visually significant. Every doctor has seen patients who can ignore even a large floater in the anterior vitreous. But floaters in the mid- and posterior vitreous cast a distinct shadow on the retina that rarely can be ignored. These moving objects can bother patients greatly and ruin the quality of life.

Doctors incorrectly suppose that the mechanism for laser treatment is breaking big floaters into many smaller floaters. Fortunately, there is more than enough power generated through the phenomenon of optical breakdown and plasma formation to transform floaters into a gas and obliterate them, rather than just breaking them into smaller pieces. The proof of this is that the surgeon can easily see a bit of the floater being vaporized and disappearing on laser hits.

They predict that laser treatment for floaters produces retinal detachments. However, my review of the world literature and personal knowledge of 3,000 additional procedures not in the literature have shown the rate of retinal detachment using a YAG laser to treat floaters is zero. Furthermore, I have treated 48 patients who had previous surgery for retinal tears or detachment. Even in these patients with known retinal deterioration, this procedure caused no retinal problems.

Doctors frequently believe that all floaters get better with time. Certainly, if blood is a component, the blood usually absorbs quickly. Some floaters improve by moving more anterior or moving out of the optical axis. But with time, other floaters do not move to a more favorable position and remain symptomatic.

Formal study

In 2002, an extensive application to the FDA to get approval to use a YAG laser in the study of the efficacy and safety of laser treatment of floaters. The FDA ruled that our study of laser treatment of vitreous opacities was a nonsignificant risk device study, and they ruled for the first time that a YAG laser could be used without special approval.

We limited our study to patients who had functional problems from their floaters. The treatment was performed with the Laserex LPQ 4106 YAG laser. Fifteen parameters were recorded for each patient, and pre- and postoperative photographs were taken. Ninety-six percent of the patients were followed for 1 year (many were from foreign countries). The results of this IRB/FDA-monitored study of 200 eyes was that there were no significant complications and the procedure was successful using our five criteria of success in 92% of patients (Table). When we did not have success, there was no harm done, and there was no evidence that a procedure had been done. In no case was vision reduced.

Table.

Success rate: Laser treatment of floaters

Floater type	Eyes	Success	Success rate (%)
Hyaline floaters:			
Weiss rings	32	31	97%
Other hyaline floaters	129	124	96%
Syneresis clouds	18	14	78%
Suspended floaters	3	3	100%
Multiple floaters	3	3	100%
Spotty floaters in young patients	15	10	67%
Total	**200**	**184**	**92%**

Source: Karickhoff JR

Equipment

Several items are needed to perform this procedure. A YAG laser is suitable for floater treatment if — when using a flat-faced contact lens — there is full illumination and clear viewing of the optic nerve while the aiming beams are also on the optic nerve. If your laser does not meet this test, you can usually still treat floaters in the anterior to mid vitreous, but farther back in the vitreous, the illumination will be obstructed by the iris. The closer the white illumination beam is to the bottom of the red aiming beam, the deeper into the vitreous floaters can be treated.

There have been occasional informal statements and a published report in which there was failure to vaporize floaters. The main reason for this failure is inadequate laser power. Laser shots lower than 2.5 mJs do not reach the level of optical breakdown and plasma formation in the vitreous, and that is the mechanism of action of this procedure. Weak shots only cause fragmentation of the floater, not vaporization. The power we used was much higher than 2.5 mJs, but varied greatly depending on the anterior-posterior location of the floaters, the contact lens used and the type of floater being treated.

Treatment techniques

There are three basic treatment techniques: complete vaporization of soft floaters caused by a posterior vitreous detachment (PVD), relocation of floater clouds suspended in the visual axis and thinning of floater clouds not in the visual axis.

Floater types

The two main classes of floaters that are treated are those that attached to the posterior vitreous face after a PVD and those that are within the vitreous as a result of vitreous degeneration.

The floaters that are pulled off the internal limiting membrane by a PVD (Weiss rings and other hyaline floaters) (Figure 1a and 1b) are quite soft and easily vaporized, require the most skill to treat and, in our study, were the most successful (completely or nearly completely vaporized in 96% of cases). The goal in this type of floater is a cure. Normally, the patient will realize the floater is gone before they stand up from the laser.

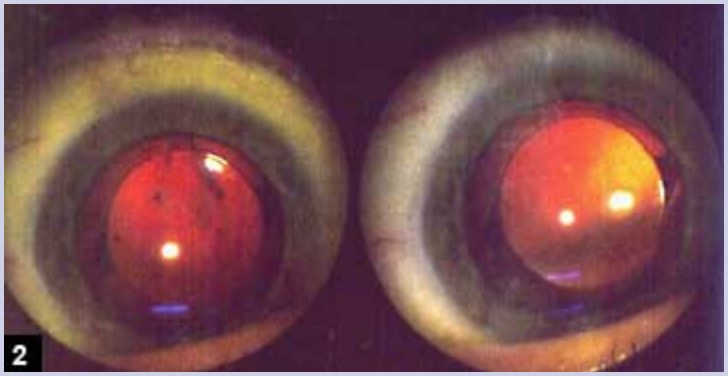
Weiss ring in both eyes (preop).

Weiss ring in both eyes (preop).

Why are these floaters the most difficult to treat? At some point in the treatment, these floaters become detached from the vitreous face and start moving toward the retina with each laser impact. I have developed 16 techniques to delay this detachment and another technique to teach the patient to flip the floater forward, away from the retina, so the surgeon can continue to work on it after it has detached from the posterior vitreous face.

Floaters within the vitreous from vitreous degeneration (syneresis floaters) that are dense and suspended directly in the optical axis by vitreous strands can nearly incapacitate patients (Figure 2). The surgical approach is to cut the superior suspending vitreous strands. Frequently, the floater will then sink to the bottom of the eye in a few seconds. This sinking gives the most dramatic improvement of all floater cases. Not only is the visual obstruction removed, but the visual acuity also improves a few lines. If the floaters do not sink to the bottom of the eye, they are then treated directly with the laser. I have treated about 30 such cases, all successfully.

Floaters within the vitreous from syneresis are usually multiple, often cloudlike, fibrous and more difficult to vaporize. There may be 10 to 100 of these floaters in an eye. If these floaters are scattered throughout the vitreous, they are treated by direct impacts from the laser (Figure 3a and 3b). All cannot be completely removed with any reasonable number of shots, so the goal is a significant improvement, not a cure. This goal was achieved in 85% of such cases in our study. These patients are grateful for the thinning out of their floaters.



Suspended floater changing vision from 20/20 to 20/100 every few seconds (preop), at left. No suspended floater (postop), at right.