

Degenerative Floaters: A Practical Review



WRITERS **Dr. Simon Chen** and **Dr. Chris Hodge**

Floaters are opacities in the vitreous cavity that occur as a result of the normal ageing process, or less commonly, due to eye disease such as uveitis, infection, intraocular haemorrhage, retinal tears, or retinal detachment.

Floaters are a common complaint noted in optometric practice but do not cause substantial problems for the majority of patients.¹ However, for a minority of patients, the impact of floaters is significant.

A 2011 survey of 266 patients with symptomatic floaters reported that the floaters were associated with a negative impact on quality of life comparable to eye conditions such as age related macular degeneration or diabetic retinopathy, and systemic diseases including stroke and colon cancer.² These patients were willing to trade an average 1.1 years out of every 10 years of their remaining life and take, on average, an 11 per cent risk of death and a 7 per cent risk of blindness to get rid of symptoms relating to floaters.

The potential psychological distress associated with floaters has been confirmed in other studies, which have also shown that exacerbating factors, such as anxiety or depression, may be present. This highlights the importance of a holistic approach to patient management in severe cases.^{3,4}

The traditional management of symptomatic floaters has been conservative, with patients being advised that symptoms will resolve with time due to neuroadaptation or the floaters drifting away from the visual axis.⁵

Increasingly, YAG laser vitreolysis and vitrectomy surgery are becoming increasingly accepted as effective treatment options for the motivated and symptomatic patient.



Dr. Simon Chen



Dr. Chris Hodge

Case 1

Acute Floaters with PVD

A 58 year old man was referred for treatment of a highly symptomatic ring shaped floater, which had developed acutely four weeks prior. He reported that the floater was 'making life miserable' and making it difficult to read comfortably. He requested YAG laser vitreolysis or vitrectomy surgery after vitreolysis read about the treatments on the internet.

MANAGEMENT

Examination demonstrated a posterior vitreous detachment (PVD) and prominent Weiss ring floater (Figure 1) with no additional ophthalmic pathology visible.

The patient was advised against surgical intervention because his symptoms had been present for only four weeks. He was counselled that there was a high chance that the symptoms would improve spontaneously with time, but if they did not resolve, there were effective treatment options available.

OUTCOME

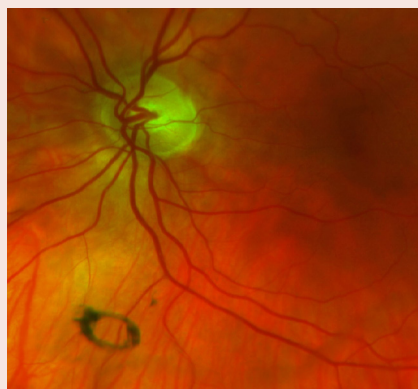
When reviewed three months later, the floater was still present but the patient

reported that he had become accustomed to it and was no longer troubled enough to desire surgical intervention.

DISCUSSION

Acute onset floaters associated with a PVD are often initially highly symptomatic, but in a majority of patients, the symptoms diminish within three months due to a combination of neuro-adaptation and the floaters gravitating away from the visual axis. Due to the high rate of symptomatic improvement, it is prudent to wait at least three to six months before considering any surgical intervention.

Figure 1



"Female gender is associated with a two-fold increase in risk of PVD"

VITREOUS

The vitreous in youth is an optically transparent gel, firmly attached to the retina. It is composed of a complex meshwork of collagen, soluble proteins, hyaluronan, and has a water content of 99 per cent.^{6,7}

With age, the vitreous becomes progressively liquefied due to changes in the way collagen and hyaluronan molecules interact. These molecular changes also lead to aggregation of intravitreal collagen fibrils, which scatter light and cause the clinical phenomenon of floaters.⁵ In children, the vitreous has a similar consistency to a semi-boiled egg, in middle age its consistency is like a runny egg and in old age it is more like a raw egg. Together with the age-related process of vitreous liquefaction, there is weakening of vitreoretinal adhesion, the combination of which leads to a posterior vitreous detachment (PVD) characterised by the separation of the posterior vitreous from the retina.⁸

RISK FACTORS FOR PVD

Age

PVD is uncommon before the age of 40, with the incidence increasing steadily from approximately 14 per cent of patients within the sixth decade, up to 80 per cent in the eighth decade of life.^{5,9}

Myopia

Myopes tend to develop PVD at an earlier age due to vitreous syneresis, a manifestation of myopic vitreopathy. The higher the degree of myopia, the younger the age of onset of PVD.^{8,10} Of note, the retinal magnification of images associated with myopia amplifies the perceived size of floaters, making them more likely to be symptomatic.²

Sex

Female gender is associated with a two-fold increase in risk of PVD. The reason for this remains unclear however the onset of menopause and hormonal changes has been suggested as a hypothesis.^{5,10}

Cataract surgery

Cataract surgery is a major risk factor for PVD, with over 50 per cent of patients developing a PVD within one year of cataract surgery. Potential mechanisms for post-operative PVD induction include a decrease of hyaluronic acid concentration leading to vitreous liquefaction and the loss of lens volume leading to forward movement of the vitreous base.

Inflammation, ocular trauma and retinal vascular disorders

These have also been implicated in the development of PVD.¹¹

PVD RELATED COMPLICATIONS

Up to 20 per cent of patients with a PVD may develop complications including retinal tear, retinal detachment (RD),

vitreous haemorrhage, macular hole or epiretinal membrane formation.^{10,12-16} PVD frequently develops in the fellow eye within two years, potentially with similar vitreoretinal consequences.¹⁷

Although most floaters seen in clinical practice are degenerative floaters related to the ageing process, it is important to exclude other pathological causes of floaters (Table 1).

ASSESSMENT OF FLOATERS

The aims of clinical assessment of patients complaining about floaters are to exclude the presence of sight threatening pathology (especially a retinal tear or RD), determine the cause of the floaters, and assess the impact that the floaters are having on vision and quality of life.

“Initial management of degenerative floaters should be conservative as the majority of floater related symptoms tend to resolve”

History

Specific features of the floaters including their duration (acute or chronic), shape, size and number should be noted.

The type and magnitude of refractive error should be determined. Floaters are more common and often more symptomatic in myopes. A history of refractive or cataract surgery should be sought.

Patients with floaters due to PVD are at risk of vitreous haemorrhage, retinal tear and detachment. These patients may report seeing flashing lights due to

vitreoretinal traction or loss of peripheral vision due to RD.¹⁸ Any history of ocular trauma should be noted.

Uveitis may present with floaters caused by inflammatory cells that have gained access to the vitreous cavity via a compromised blood-retina barrier. Patients should be questioned about concurrent ocular symptoms of uveitis, such as photophobia, redness or discomfort, as well as features associated with systemic disease, such as lethargy, weight loss, fever, cough, joint pain or rashes.^{19,21} Systemic causes of uveitis that may cause floaters include a wide variety of autoimmune, infectious and idiopathic conditions.

A medical history should be obtained to identify conditions that may predispose to developing floaters including diabetes, toxoplasmosis, trauma, and autoimmune disease. A family history of RD or hereditary conditions affecting vitreous collagen such as Stickler syndrome or Marfan syndrome should be identified.²²

EXAMINATION

Visual acuity is typically unaffected by degenerative floaters unless they block the visual axis but they can cause a reduction in contrast sensitivity.^{23,24} Patients with extensive floaters associated with vitreous haemorrhage or intraocular inflammation may have reduced visual acuity.

Slit-lamp examination of the anterior segment should assess for signs of uveitis (anterior chamber cells, keratic precipitates, posterior synechiae). The anterior vitreous can be visualised behind the lens using a bright thin slit-beam offset by 10 degrees from the visual axis. The presence or absence of floaters, pigment (‘tobacco dust’), red blood cells or white cells behind the lens should be carefully assessed. Asking the patient to quickly look down and then straight ahead mobilises the vitreous and may bring pigment in the inferior vitreous into view behind the lens. The finding of tobacco dust (a positive Shafer’s sign) indicates the likely presence of a retinal tear. If a PVD is advanced (i.e. the posterior vitreous has separated from the posterior pole and has moved anteriorly

Table 1

Primary	Secondary
Vitreous liquefaction (collagen aggregation)	Vitreous haemorrhage
Embryonic hyaloid vasculature remnants	Retinal break or tears (avulsed retinal tissue)
Posterior vitreous detachment	Asteroid hyalosis
	Infection
	Uveitis
	Malignancy (e.g. intraocular lymphoma)
	Intraocular foreign body
	Intraocular injections or surgery

behind the lens) the posterior hyaloid membrane may be visible as a well-defined crinkly membrane behind the lens.

The presence of a PVD is commonly associated with a Weiss ring representing the remnant of the vitreopapillary attachment and the peripapillary glial tissue at the optic disc.²⁴ This can typically be seen directly anterior to the optic disc with patients describing a circular or semi-circular shaped floater.

Characteristics of floaters to note include their number, shape (dots, rings, strands, snowballs or clumps), colour (white, red, or brown), location (anterior, posterior, inferior or diffuse), and mobility as these provide clues regarding the aetiology and potential visual impact. For example, intravitreal injections of the steroid triamcinolone, can result in white floaters which tend to gravitate to the inferior vitreous. The presence of vitreous or retinal haemorrhage is associated with an increased risk of retinal tear or RD.²⁵

The retina should be examined for signs of posterior uveitis (toxoplasmosis scars, retinal vasculitis, retinitis), retinal vascular disease, retinal tears or retinal detachment. It should be assumed that all patients with floaters have a retinal tear until proven otherwise by detailed assessment of the peripheral retina.²⁶⁻²⁸ Scleral indentation with binocular indirect ophthalmoscopy should be performed to exclude the

peripheral retinal tears as approximately 10 per cent may not be visible with slit-lamp biomicroscopy alone.²⁹

“Vitreotomy surgery typically allows removal of all symptomatic floaters and results in high levels of patient satisfaction”

IMAGING FLOATERS

Floaters are often difficult to visualise with traditional fundus cameras. Devices using scanning laser technology (e.g. Optos cameras and some optical coherence tomography units) can usually demonstrate floaters more clearly than fundus cameras. Ocular ultrasound can be useful to exclude the presence of an RD in patients with dense vitreous haemorrhage or other media opacity when the view of the fundus is obscured.²⁴

Optical coherence tomography (OCT) may be helpful to visualise floaters located within the pre-macular bursa area, which is an optically empty vitreous cystern located immediately anterior to the macula (see Case 2).

MANAGEMENT OF DEGENERATIVE FLOATERS

Specific treatment of associated eye disease is directed at the cause e.g. retinal tears, RD, intraocular haemorrhage, intraocular infection, posterior uveitis, or intraocular malignancy, and is beyond the scope of this article.

Initial management of degenerative floaters should be conservative as the majority of floater related symptoms tend to resolve or become less noticeable without treatment within three to six months of symptom onset. When floater symptoms persist long term, it is not uncommon for patients to ‘doctor shop’ for floater treatment.³¹

For those patients that have chronic symptomatic floaters, the management options include:

Conservative management (watchful waiting or psychological counselling). Reassurance that there is no serious underlying disease present can be sufficient to allay the fears of many patients and avoid the need for surgery. Some patients can become distressed or depressed about floater related symptoms

Case 2

A Young Patient with Floaters in the Premacular Bursa

A 26 year old emmetropic woman complained of a six year history of multiple dot shaped floaters, which were constantly visible in her central visual field. She reported that the constant distraction caused by the floaters had caused her to become socially withdrawn and anxious. Examination by numerous optometrists over the previous six years had revealed no visible pathology. The patient presented requesting YAG vitreolysis after having researched treatment for floaters on the internet.

MANAGEMENT

Careful high magnification visualisation using a Goldman 3 mirror lens revealed multiple small floaters in close proximity to the macula. OCT scanning demonstrated floaters in the premacular bursa (Figure 2).

The patient was advised that YAG laser vitreolysis was not an appropriate treatment option due to the proximity of the floaters to the macula. She was advised that vitrectomy surgery was possible to remove the floaters and alleviate her symptoms but was counselled against

it due to the likelihood of developing a post-vitreotomy cataract, which would require cataract surgery and lead to a loss of accommodation. Positive aspects of her situation were highlighted and reinforced (i.e. no serious sight-threatening pathology was present and the option of surgery was available if her quality of life was severely affected by the floaters in the long-term). She was referred to a general practitioner for management of anxiety.

OUTCOME

At review six months later, the patient reported a moderate reduction in symptoms and improvement in quality of life. She had started anxiolytic medication and learned cognitive behavioural coping strategies to distract her from thinking about the floaters under the guidance of a clinical psychologist. She felt her symptoms had improved to a point that she no longer desired surgical intervention.

DISCUSSION

Some young patients have floaters localised to the premacular bursa, which are difficult to visualise on slit-lamp examination. Due to their proximity to the retina, floaters in the pre-macular bursa can cause a high level of symptoms. It is not uncommon for patients with floaters in the pre-macular

bursa to have visited numerous eye care practitioners who have been unable to identify the troublesome floaters. This can lead to a loss of confidence by the patient and prompt them to ‘doctor shop’.

Floaters in the pre-macular bursa are not treatable with a YAG laser because they are hard to visualise and because their proximity to the macula makes the risk of inadvertent retinal damage by laser high.³⁰

This case highlights the benefits of a holistic approach to patient care in which mental state and feelings should be considered and managed, in this case by positive reinforcement, psychological counselling and psychoactive medication when appropriate.

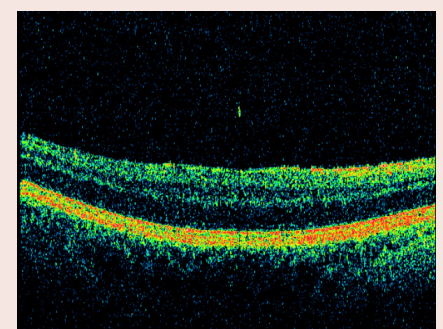


Figure 2

Case 3

A Middle Aged Man With Chronic Floaters Seeking Treatment

A 45 year old man with an 18 month history of highly symptomatic floaters requested treatment because he felt they were interfering with his ability to drive safely.

MANAGEMENT

Examination demonstrated a large clump of degenerative floaters in the central vitreous cavity suspended close to the visual axis (Figure 3). No other ocular pathology was seen.

After a thorough informed consent process, YAG laser vitreolysis was performed using 200 laser shots to partially vaporise the floaters. Immediately after the laser treatment, the floaters were noted to be less dense and numerous gas bubbles generated by the laser were visible (Figure 4).

A second session of laser was performed the same day, using an additional 200 laser shots following which the floaters were noted to be barely visible (Figure 5).

OUTCOME

When reviewed one month post-op, the patient was symptom free. No complications were noted.

DISCUSSION

This case demonstrates the potential efficacy of YAG laser vitreolysis in reducing floater related symptoms. Easily visualised, isolated large symptomatic floaters localised to the mid-vitreous cavity are often suitable for YAG vitreolysis.

The potential risks of YAG vitreolysis include cataract formation if the crystalline lens is inadvertently hit with a laser pulse. There have been case reports of raised intraocular pressure (IOP) occurring up to one month post treatment, potentially due to debris released by vitreolysis clogging up the trabecular meshwork. The rise in IOP is usually transient and can be managed with short term topical therapy but there have been reports of glaucoma filtration surgery being required.^{33,34}

The ideal candidate for YAG laser vitreolysis is a highly symptomatic patient with a small number of easily visualised floaters located in the mid-vitreous cavity (or located in the anterior vitreous cavity in pseudophakes). This treatment is not suitable for patients with floaters that cannot be easily visualised on slit-lamp examination, those with large numbers of floaters, or those with floaters located close to the retina or crystalline lens (but floaters close to an IOL can be safely treated) due to the risk of secondary damage from aberrant laser pulses. Floaters located within the pre-macular bursa are too close to the macula for safe application of laser.

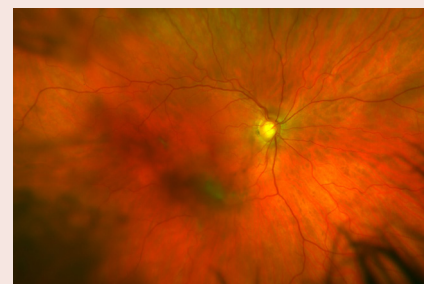


Figure 3



Figure 4

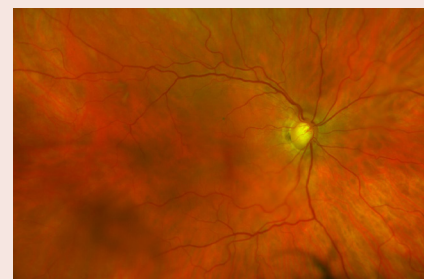


Figure 5

and may benefit from psychiatric assessment by their general practitioner or a mental health professional.

YAG Laser Vitreolysis

This involves the use of a YAG laser to vaporise floaters to reduce floater related symptoms. It is performed in a clinic setting using topical anaesthesia, a fundus contact lens and a slit-lamp mounted YAG laser. Depending on the number and size of floaters, multiple treatment sessions may be needed. In many cases, only partial but not complete resolution of floater symptoms is possible.

A 2017 randomised clinical trial comparing a single session of YAG vitreolysis versus sham treatment (control) for symptomatic floaters in 52 eyes showed a significantly greater symptomatic improvement (54 per cent) in the treatment group than controls (9 per cent).³² Significant or complete resolution of symptoms was reported by 53 per cent of patients at postoperative month six. Several measures of quality of life also improved compared with those in the sham laser group, including general vision, peripheral vision, and independence. The YAG

group reported numerous improvements six months after treatment, including in near and distance activities and mental health. No complications were noted in either group.

“Cataracts tend to develop faster in patients over 50 and require earlier surgery, often within six to 12 months”

Vitreotomy Surgery

Surgical removal of floaters is an option if symptoms significantly affect the patient's quality of life and the patient has been unresponsive to, or unsuitable for, YAG

laser vitreolysis. Vitrectomy surgery typically allows removal of all symptomatic floaters and results in high levels of patient satisfaction. The surgery is usually performed under local anaesthesia with sedation as a day case procedure. A pars plana vitrectomy using 23, 25 or 27 gauge probes is performed to remove the vitreous and associated floaters.

A downside of surgery is the inevitable premature development of cataract which occurs in over 70 per cent of patients following vitrectomy surgery at three years.³⁵ Cataracts tend to develop faster in patients over 50 and require earlier surgery, often within six to 12 months.³⁶ As many patients that present for floater surgery are myopic, subsequent cataract surgery represents an opportunity to reduce or eliminate their refractive error and reduce their dependency on optical correction. The risk of sight threatening complications following vitrectomy surgery includes retinal detachment (1–5 per cent), and endophthalmitis (0.058 per cent).^{37,38}

CONCLUSION

When assessing patients complaining about floaters, it is important to exclude sight threatening conditions such as retinal tear,

Case 4

Floaters After YAG Laser Posterior Capsulotomy

A 76 year old woman complained of blurred vision persisting for six months following a YAG laser posterior capsulotomy for treatment of posterior capsule opacification.

MANAGEMENT

Examination revealed a free floating capsular remnant in the anterior vitreous, located in the visual axis behind an IOL (Figure 6).

Additional ocular pathology was excluded. YAG laser vitreolysis

was performed to ablate the centrally located floater.

OUTCOME

When reviewed three months' post-op, the patient was symptom free.

DISCUSSION

Floaters may develop following YAG laser posterior capsulotomy, particularly if a circular pattern (or can-opener) technique is employed.³⁵ The capsular remnants are often suitable for treatment with YAG laser vitreolysis because they are few in number and easily visualised when applying YAG laser shots. Additionally, the eye's pseudophakic status removes the risk of cataract formation that can occur in phakic eyes.



Figure 6

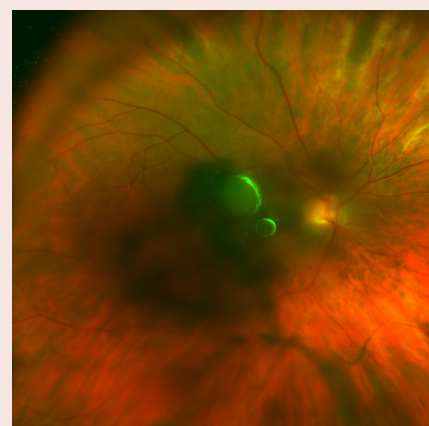


Figure 7

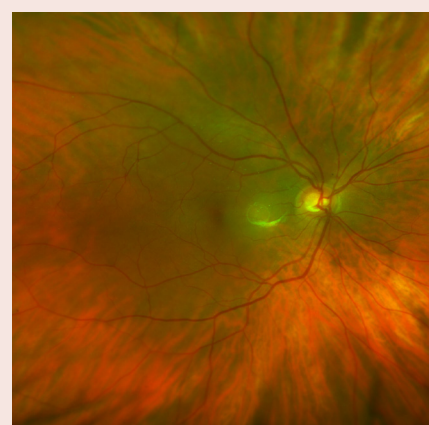


Figure 8

Case 5

Floaters After Cataract Surgery

A 50 year old lawyer was referred complaining of disturbing floaters, which were noted following cataract surgery with implantation of multifocal intraocular lenses (IOLs) 18 months prior. The patient had been a moderately high myope (-5.00D in both eyes) prior to surgery. The symptoms were impacting her ability to read comfortably and interfering with her work.

MANAGEMENT

Examination revealed numerous strand-like vitreous floaters distributed throughout the vitreous with many localised in the visual axis (Figure 7).

Additional ocular pathology was excluded. YAG laser vitreolysis was considered to be inappropriate due to the large number and location of floaters close to the retina. After extensive discussion regarding the option of conservative management and the potential risks of surgery, vitrectomy was performed without complication.

OUTCOME

When reviewed three months post-op, the patient was symptom free (Figure 8).

DISCUSSION

Patients often report symptomatic floaters following cataract surgery. Potential reasons include:

1. Pre-existing floaters becoming more visible
2. Crystalline lens particles released during the process of phacoemulsification passing through the zonules into the vitreous
3. Inflammatory cells associated with surgical inflammation, and
4. PVD induced by cataract surgery.

Of note, multifocal IOLs may increase floater symptoms because the multiple IOL focal planes allow multiple floaters at different locations in the vitreous to be seen more clearly.

Pseudophakic patients are often ideal candidates for vitrectomy surgery because the absence of a crystalline lens and the usual presence of a PVD makes surgery technically easier. This means the surgeon does not need to worry about inadvertently touching the lens with the vitrectomy instruments and does not need to induce a PVD. Additionally, the procedure is potentially safer because there is no risk of cataract formation, and the risk of post-operative RD when a PVD does not need to be induced is potentially reduced.

RD and uveitis amongst others. In patients with degenerative floaters, a conservative 'watch and wait' approach is appropriate for the large majority.

Clinicians should be aware that floaters can have a significant impact on vision and quality of life, so patients complaining of chronic symptomatic floaters should be informed about the potential pros and cons of treatment options such as YAG laser vitreolysis or vitrectomy surgery, which may

be effective in reducing or eliminating floater related symptoms in motivated patients. 

To earn your CPD points from this article answer the assessment available at mivision.com.au/degenerative-floaters



Dr. Simon Chen MBBS, FRANZCO is an experienced cataract and retinal surgeon at Vision Eye Institute in Chatswood, Bondi Junction, and Drummoyne in Sydney. He is also Conjoint Senior Lecturer at UNSW. He has an interest in performing complex cataract

surgery in patients with retinal disease or ocular trauma. Dr. Chen has had the privilege of performing cataract or retinal surgery on over 100 Sydney optometrists and their closest relatives and was the first surgeon in the world to perform femtosecond laser cataract surgery combined with vitrectomy surgery.

Dr. Chris Hodge (PhD) is a clinical research coordinator at Vision Eye Institute.

References

Available at mivision.com.au