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Symptomatic Vitreous Floaters: A Practical Guide for

Patients



Introduction

This practical guide on Symptomatic Vitreous Floaters (SVF) is designed to provide you with clear and straightforward yet comprehensive information to help you better understand this condition. Whether you are affected by it or simply curious to learn more, here you will find answers to the most common questions.

Please note that this document reflects my personal experience and the way I typically explain SVF to patients throughout their journey: from the first consultation, which may be an online video consultation, to the in-person eye examination, preoperative preparation, and post-operative follow-ups.

Of course, this guide cannot replace the direct relationship between doctor and patient. For this reason, I am always available to assist you and address any questions you may have.

How Can I Help You?

With an in-person visit in Rome:

You can visit me at my practice in Viale di Villa Massimo 37 (Microchirurgia Villa Massimo). Appointments can be booked by calling **+39 06 64220334**.

With an online video consultation:

Book your consultation directly on **www.giuliobamonte.com** or **www.giuliobamonte-floaters.com**.

For further information or questions:

Visit <u>www.giuliobamonte.it</u>, follow me on my Facebook page, *Studio Oculistico Dottor Giulio Bamonte*, or write to me on WhatsApp at +**39 349 6317561**.

I am here to guide you at every step, providing the care and attention your eyes deserve.

Giulio Bamonte

Summary

Vitreous floaters are small spots or wavy lines that appear to float in the visual field, especially when looking at a bright sky or a white wall. These phenomena are very common and occur as the gel-like substance in the eye, called the vitreous humor, begins to change with age. In most cases, floaters are harmless but can be annoying and, for some individuals, even distressing. This document explores the challenges associated with floaters and their impact on daily life.

Here are the key points discussed:

Types of Floaters:

- **Primary:** Physiological changes related to aging.
- Secondary: Resulting from eye conditions or surgical interventions.

Emotional Impact:

• *Many patients experience anxiety related to floaters, and it is not uncommon for them to seek psychological support or counseling to manage their distress.*

Diagnosis of Floaters:

• Often, the tools used by doctors cannot fully capture the issues reported by patients, creating a discrepancy between what the doctor observes and what the patient perceives.

Management Strategies:

- In most cases, doctors can reassure patients by explaining that floaters are not dangerous, helping them learn to live with the condition.
- For patients who find floaters particularly debilitating, a surgical procedure called vitrectomy is available but is reserved for the most severe and persistent cases.

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The Vitreous: Anatomy and Degeneration

The vitreous is a transparent, gel-like substance that fills the posterior part of the eye, located between the lens and the retina. It is primarily composed of water (approximately 98–99%) and a three-dimensional network of collagen and hyaluronic acid, which give the vitreous its gel-like consistency. The vitreous is divided into two main regions:

- Inner part (vitreous core): Predominantly liquid, consisting of water and collagen filaments.
- Outer part (vitreous cortex): Denser and made up of a thin network of collagen and hyaluronic acid. This layer adheres to the retina in specific areas, such as the vitreous base, the optic nerve head, and retinal vessels.

Vitreous Degeneration

With aging (starting as early as 10–15 years), the vitreous undergoes progressive degeneration. This process includes:

- Liquefaction (syneresis): The gel-like component of the vitreous becomes increasingly liquid, leading to the formation of aqueous pockets (areas of complete liquefaction).
- Aggregation of collagen fibers (synchysis): The collagen fibers that make up the vitreous network clump together, forming dense strands or clumps visible as floaters.

These clumps and pockets constitute **vitreous floaters (VF)**, a natural manifestation of age-related vitreous degeneration.

Types of Vitreous Floaters

Floaters can be categorized as:

- **Primary VF:** Arising exclusively from the natural degeneration of the vitreous. They are not associated with ocular or systemic diseases and are comparable to other signs of physiological aging, such as gray hair. While more common in older individuals, they may also appear in younger people without indicating any underlying pathology.
- Secondary VF: Resulting from pathological conditions or external events, including:
 - Intraocular bleeding (e.g., from retinal vessel rupture or trauma).
 - Intraocular inflammation (uveitis).
 - Congenital conditions (such as persistent fetal vasculature).
 - **Post-surgical complications** (e.g., after surgery for retinal detachment or cataract).

• **Ocular tumors** (e.g., choroidal melanoma).

Primary VF: Physiological Aging

Unlike secondary VF, primary floaters are not a sign of ocular disease. Vitreous degeneration is a natural age-related process and does not require treatment if symptoms are mild.

Always Consult an Eye Specialist Upon Onset

Although generally a physiological and benign phenomenon, it is advisable to consult an ophthalmologist when floaters first appear or if there is a sudden worsening of symptoms, especially if accompanied by flashes of light in the affected eye. This ensures that the cause is normal vitreous degeneration and not a more serious condition (e.g., another pathology or posterior vitreous detachment).

Posterior Vitreous Detachment (PVD)

PVD occurs when the vitreous cortex detaches from the retina, becoming complete when it separates from both the macula and the optic nerve head. PVD can present with sudden floaters and flashes of light and may sometimes be associated with retinal tears, which, if untreated, can lead to retinal detachment. PVD is most common between the ages of 55 and 65 but can occur earlier in myopic individuals or following trauma.

If symptoms arise, an urgent ophthalmological examination is essential to evaluate for complications. (*For further details, see Appendix 1: Posterior Vitreous Detachment.*)

Symptomatic Vitreous Floaters (SVF)

Most people experience no significant issues related to vitreous degeneration and can live with floaters without difficulty. It is normal, especially initially, to feel discomfort or annoyance when floaters first appear, but over time, many individuals adapt and eventually ignore or forget about them. Even in cases of posterior vitreous detachment (PVD), the initial discomfort, which can be significant in the first weeks, tends to diminish. In most cases, patients adapt to the new condition within 1–2 months.

In such situations, no specific treatments are required. Sometimes, taking vitamin supplements, staying hydrated, and avoiding strain or sudden movements may be recommended, but none of these remedies have been proven effective in reducing symptoms or preventing retinal

complications. The best approach is to avoid focusing on the floaters, allowing the brain to adjust to the new visual perception.

However, a small percentage of patients experience persistent and significant discomfort due to floaters, whether the vitreous is still attached or after a PVD. This discomfort, which can become particularly debilitating, negatively affects vision, psychological well-being, and quality of life. The reasons why some patients develop this discomfort while most do not remain unclear. However, it is evident that patients with particularly pronounced vitreous degeneration are at greater risk of symptoms. Additionally, floaters tend to be more bothersome when located near the retina or macula.

Cognitive and Psychological Factors

A psychological explanation closely related to vitreous degeneration can be attributed to the cognitive mechanism known as **selection bias**. This occurs when a patient, noticing floaters for the first time, begins to focus more on them, amplifying their significance in their visual experience.

Additionally, patients often report that floaters seem to increase rapidly over time, creating the impression of continuous worsening. While this phenomenon likely has an anatomical basis, it can also be explained by the cognitive mechanism known as **confirmation bias**. This leads patients to notice and remember more easily the moments when floaters are present or bothersome, reinforcing the subjective impression of deterioration. (*For further details, see Appendix 2: Selection Bias and Confirmation Bias.*)

Defining Symptomatic Vitreous Floaters

Regardless of the cause, floaters are classified as symptomatic vitreous floaters (SVF) when:

- The discomfort is intense and persists over time (beyond 6 months to 1 year).
- It does not diminish with natural adaptation.

Impact on Visual Quality

In general, SVF do not affect visual acuity. Many patients still achieve 20/20 vision at a distance and can read comfortably up close. However, SVF can reduce **visual quality**, causing symptoms such as:

- Decreased contrast sensitivity.
- Perception of a gray or cloudy veil moving across the visual field.
- Moving opacities, filaments, cobwebs, or floaters resembling insects on a car windshield.

- After complete PVD, some patients report specific opacities, such as circles, semicircles, or commas, which can be particularly bothersome.
- Visual disturbances such as visual snow, afterimages, halos around lights, or photosensitivity. (*For further details, see Appendix 3: SVF—A Syndrome Rather Than a Symptom?*)

Symptomatic Vitreous Floaters (SVF): A Diagnostic Dilemma

Symptomatic vitreous floaters (SVF) pose a unique challenge for ophthalmologists. Unlike other well-characterized ocular conditions such as cataracts, retinal detachment, or macular holes, SVF often present a significant discrepancy between the symptoms reported by the patient and the findings from clinical examinations. This discrepancy complicates not only the diagnosis but also the understanding and management of the condition for both the doctor and the patient.

Challenges in Diagnosing SVF

In patients with SVF:

- Visual acuity is often normal: The patient's vision may remain intact without noticeable abnormalities.
- Clinical examination of the vitreous often appears unremarkable: Except in cases of posterior vitreous detachment (PVD), the vitreous often looks normal during clinical evaluation.
- **Traditional diagnostic tools fail to detect significant abnormalities:** Techniques such as slit-lamp examination, OCT, fundus photography, and even ultrasound often do not reveal noticeable vitreous opacities, despite the patient reporting significant visual disturbances.

Frustration from the Symptom-Clinical Mismatch

This mismatch between symptoms and clinical findings can lead to frustration:

- For the patient: They may feel misunderstood or even disbelieved.
- For the ophthalmologist: They struggle to correlate the symptoms with a clear anatomical or functional cause.

Why Can't Ophthalmologists See the Floaters Patients Complain About?

One of the most common issues in patients with SVF is the **discrepancy** between what the patient perceives as a significant visual problem and what the ophthalmologist observes during the examination. A recent study found that **96.6% of examined eyes showed no evident vitreous opacities**, despite patients reporting severe symptoms. This occurs because:

- Light scattering: Small alterations in the vitreous cause intense forward light scattering towards the retina, leading to significant visual disturbances. However, these changes are often invisible with traditional clinical tools.
- **Disparity between forward and backward light scattering:** The backscattered light, which is what the ophthalmologist sees during slit-lamp examinations, is up to six orders of magnitude weaker than the forward-scattered light affecting the retina. This explains why a vitreous that appears "normal" during an examination can still cause debilitating symptoms.

The Psychological and Functional Impact of Vitreous Floaters

Despite the limitations of diagnostic tools in detecting vitreous floaters, patients often experience symptoms that significantly impair not only their visual capacity but also their mental well-being.

Data on Psychological Impact

- **76.6%** of patients with symptomatic vitreous floaters (SVF) report symptoms of anxiety or emotional distress related to their condition.
- 43.3% seek psychological support to cope with their symptoms.
- 36.6% use medications to alleviate emotional disturbances caused by the floaters.

Furthermore, essential daily activities such as reading, working on a computer, or driving can become severely compromised—even when ocular examinations fail to reveal significant abnormalities.

The Complex Relationship Between Floaters and Psychological Distress

The link between psychological distress and SVF is intricate, making it challenging to determine the primary cause: visual symptoms or psychological discomfort.

- **Pre-existing conditions:** In some cases, anxiety and depression were present before the onset of floaters.
- **Symptom-induced distress:** For most patients, however, psychological symptoms emerge or worsen following the appearance of floaters.

This interaction underscores a strong bidirectional relationship between visual problems and mental health, often blurring the lines between cause and effect. It reinforces the understanding that floaters, while frequently invisible to diagnostic tools or dismissed as minor, can represent a profoundly disabling condition for certain individuals.

Who Are the Patients Who Complain About SVF?

Patients with symptomatic vitreous floaters (SVF) can be categorized into five distinct groups. Each group has unique clinical, psychological, and symptomatic characteristics that require tailored approaches.

1. The Patient in Their Sixties with Acute Vitreous Detachment

This group represents an ophthalmic emergency. These patients report the sudden appearance of flashes (photopsias) in one eye and floaters in their visual field. Posterior vitreous detachment (PVD) must be urgently assessed through a fundus examination to rule out retinal detachment.

- If retinal tears are detected: Immediate laser treatment is necessary.
- After the acute phase: Residual floaters may be bothersome, but most cases improve within one to two months.
- **Persistent symptoms:** If floaters remain disruptive, vitrectomy may be considered, but only after a waiting period of at least six months to allow stabilization.

2. The "Random" Patient Who Notices Floaters for the First Time

This type of patient visits the clinic because they have recently, often accidentally, noticed the presence of filaments or "flies" in their visual field and want to understand what they are.

- **Diagnostic focus:** Distinguishing between primary (benign) floaters and secondary floaters linked to retinal or ocular pathologies is crucial.
- **Management:** No treatment is necessary for primary vitreous floaters. These patients should be reassured and adequately informed.

• **Prognosis:** Most of these patients will continue their lives without further issues. A small percentage may, however, progress to a more significant perception of the problem, eventually transitioning into the next category.

3. The Patient with Tolerable, Yet Annoying SVF

These patients describe SVF as an obstacle to fully enjoying everyday moments, such as admiring a scenic view or a sunny day. They may also struggle to concentrate at work, though the situation remains manageable.

• Typical characteristics:

- Often well-informed, having already consulted multiple ophthalmologists and researched online, in forums, or dedicated groups.
- Familiar with potential treatments like YAG laser, atropine, or supplements, and many have already started drinking plenty of water to alleviate the symptoms.
- **Challenges:** Many ophthalmologists fail to "see" the floaters that patients complain about, leaving them feeling misunderstood.
- **Decision-making:** These patients are often indecisive about pursuing vitrectomy or other treatments, fearing complications. Most adapt to the problem or tolerate it, albeit reluctantly. However, some may progress to the next groups.

4. The Patient Severely Affected, with Significant Psychological Impact

These patients live in a state of chronic discomfort. The presence of SVF interferes with essential activities such as driving, reading, working on a computer, or focusing.

• Impact on life:

- Social and work life is disrupted.
- They avoid outings, refrain from going to the beach, and often wear hats and sunglasses to seek relief.
- **Psychological toll:** Many show signs of depression or a reduced ability to cope with the problem.
- **Support needed:** Psychological assistance is crucial to complement any potential surgical intervention.

5. The Overwhelmed Patient

These patients experience extreme distress where visual disturbances overshadow psychological aspects. They describe floaters as a constant visual torment that prevents them from leading a normal life.

- **Previous attempts at treatment:** Some have tried YAG laser or even partial vitrectomy without achieving significant improvement.
- **Recommended approach:** For these patients, a complete vitrectomy is not only possible but often advisable, as it may be the only way to improve their quality of life.

A Comprehensive Diagnostic Approach to Vitreous Floaters

Given the diagnostic challenges and the crucial role of psychology in shaping or amplifying discomfort, a comprehensive approach to vitreous floaters must address all aspects of the condition. This includes combining a thorough anatomical evaluation with an in-depth understanding of the patient's subjective experience.

Anatomical Diagnosis

An effective diagnostic process begins with a detailed ocular assessment:

1. Comprehensive History

Gather detailed information on the patient's personal and family medical history, reported symptoms, and their impact on the patient's quality of life.

- 2. Complete Eye Examination Include tests such as visual acuity measurement, refraction, intraocular pressure, and evaluation of ocular structures using advanced tools like:
 - Optical Coherence Tomography (OCT)
 - Retinal imaging
 - Ocular ultrasound
- 3. Advanced Techniques

Employ advanced diagnostic technologies, such as:

- Quantitative ultrasound to detect vitreous alterations.
- Contrast sensitivity testing to assess visual function.
- Light scattering measurements to quantify disruptions caused by vitreous changes.
- 4. While not yet commonly used, these tools hold promise for providing deeper insights into vitreous pathology.

Even when instrumental tests are negative for floaters, they play a key role in ruling out other ocular pathologies, offering a clearer understanding of the overall clinical picture.

Patient-Centered Care

The patient's narrative is vital to achieving a complete diagnosis. A patient-focused evaluation should consider:

- Symptom triggers and context Identify when and where symptoms are most troublesome, noting lighting conditions or times of day that exacerbate discomfort.
- Impact on quality of life Understand how floaters affect concentration, daily activities (such as reading, computer work, or driving), and psychological well-being.
- Coping mechanisms Assess strategies patients may have adopted, such as using sunglasses, adjusting light settings, or other methods to minimize discomfort.
- Previous treatments Evaluate any prior therapies attempted and their outcomes.

Long-Term Monitoring

To track the condition's progression and identify natural adaptations, schedule:

- Regular follow-ups over 6–12 months These appointments can help monitor symptom evolution and perceived discomfort.
- Standardized questionnaires Use validated tools to measure the impact of floaters on visual function and quality of life over time.

Building Trust

Managing vitreous floaters requires a strong doctor-patient relationship based on trust and understanding:

• Psychological support Acknowledge the importance of mental well-being in the treatment process. • Tailored treatments

Explore options ranging from conservative strategies to pharmacological treatments, and, in refractory cases, surgical interventions such as complete vitrectomy.

A New Perspective

Patients with vitreous floaters should not be evaluated solely based on clinical findings. It is essential to integrate objective data with a thorough understanding of their subjective experience.

This combined approach, leveraging advanced diagnostic techniques and attentive listening, can bridge the gap between what the ophthalmologist observes and what the patient experiences. It ultimately enables a more personalized and effective management of this condition.

Therapeutic Approach to Symptomatic Vitreous Floaters (SVF)

The management of symptomatic vitreous floaters (SVF) requires a gradual, personalized, and multidisciplinary approach that considers not only the extent of visual disturbance but also its psychological impact. Since no preventive therapies or non-surgical definitive treatments exist, it is crucial to balance interventions with appropriate patient education and continuous monitoring.

A Gradual Approach

The therapeutic pathway varies depending on the severity of symptoms and their impact on quality of life:

Education and Reassurance

For mild or transient cases, proper information is essential. Explaining that SVF, in most cases, does not indicate a serious pathology and may improve over time helps alleviate anxiety and concerns.

Avoiding Unnecessary Treatments

Therapies lacking scientific evidence, such as vitamin supplements, antioxidants, or lifestyle modifications (e.g., increasing water intake or avoiding physical strain), have not demonstrated specific efficacy and should not be recommended.

Observation and Monitoring

In cases where the discomfort is more pronounced but not debilitating, an observation phase with periodic check-ups (every 6–12 months) can be beneficial to track potential spontaneous improvements or natural adaptation.

Psychological Evaluation

For patients whose visual symptoms are linked to significant psychological distress, a psychological evaluation may be helpful:

- Goals: The evaluation does not aim to "cure" floaters but to explore and clarify psychological contributors to discomfort, such as anxiety, depression, or adaptation difficulties.
- Personalized Approach: Identifies patients who could benefit from psychological support or stress management techniques to improve their overall quality of life.
- Indications: Particularly useful in cases where perceived discomfort outweighs the visible severity of the floaters or in patients who demonstrate strong resistance to natural adaptation mechanisms.

Conservative Treatments

Conservative options may include pharmacological or minimally invasive approaches:

Low-Dose Atropine (0.01%)

- Effectiveness: Some patients report significant improvement, while others find limited benefit.
- Limitations: Side effects such as photophobia and partial loss of accommodation can affect patients differently.
- Indication: Suitable for initial stages to determine whether to continue with conservative management or consider more invasive treatments.

YAG Laser Vitreolysis

- Objective: Aims to fragment floaters into smaller, less intrusive particles.
- Effectiveness: Partial and not always satisfactory.
- Risks: Possible complications include intraocular inflammation and damage to ocular structures, making this option generally unsuitable for unselected cases.

Towards More Definitive Solutions

When symptoms are persistent, significant, and disabling, surgical intervention may be considered. Among these, vitrectomy is the most definitive solution. However:

- Accurate Patient Selection: The procedure must be reserved for patients whose discomfort outweighs the potential risks of surgery.
- Risk-Benefit Assessment: Thorough discussions about the benefits, limitations, and possible complications of the intervention are essential to ensure informed consent.

Vitrectomy

Vitrectomy is an advanced surgical procedure involving the removal of the vitreous, the transparent gel-like substance that fills the posterior part of the eye and can be responsible for vitreous floaters. It is the only definitive option to eliminate symptomatic vitreous floaters (SVF), resolving the visual disturbance at its root for severely affected patients.

However, it is an invasive procedure and, like all surgeries, carries potential risks. For this reason, it is not suitable for everyone and should be reserved for patients who meet well-defined criteria, requiring careful medical assessment.

Indications for Vitrectomy

Vitrectomy is recommended for patients who:

1. Experience Significant and Persistent Symptoms

The discomfort caused by floaters must be documented, chronic, and not improve spontaneously.

2. Have Failed Conservative Approaches

Patients should have attempted less invasive strategies, such as adaptation time, wearing sunglasses, or conservative treatments (e.g., atropine) without achieving relief.

3. Demonstrate a Clear Understanding of the Procedure

Patients must be fully informed and show a thorough understanding of:

- The expected benefits of the procedure.
- The limitations of the surgery.
- The potential risks.
- The postoperative course, including necessary precautions and recovery time.

Decision-Making Process

To ensure the safety and efficacy of the procedure, the decision-making process must rely on a rigorous evaluation and continuous dialogue between the physician and the patient. This includes:

Patient Education

- Provide information on available options and the potential for improvement with conservative approaches.
- Clearly explain the benefits, risks, and limitations of vitrectomy.

Extended Assessment

- Monitor the patient for 6–12 months to evaluate whether symptoms improve naturally or if the discomfort remains disabling.
- Confirm the patient's inability to adapt to the condition.

Accurate Diagnosis

- Rule out other concurrent ocular conditions that could contribute to the symptoms.
- Confirm the presence of primary SVF through detailed diagnostic tests.

Measurement of Discomfort

• Use standardized questionnaires to assess the impact of floaters on quality of life.

Independent Second Opinion

• Consult with another ophthalmologist not directly involved in the procedure to ensure an impartial opinion and further confirmation.

A Definitive Solution

Vitrectomy is a resolutive procedure that can restore clear vision for patients with severe and chronic symptoms. However, it must be reserved for carefully selected cases. Accurate diagnosis, prolonged evaluation, and clear communication between doctor and patient are essential to ensure an informed decision and optimal outcomes.

How Vitrectomy is Performed and What It Involves

Vitrectomy is a safe and well-tolerated surgical procedure designed to remove altered vitreous and address problems caused by floaters. While relatively straightforward for the patient, the procedure requires great precision and expertise from the surgeon.

Preparation

Before the surgery, the patient must undergo several preliminary tests, including an **electrocardiogram** and blood tests such as blood sugar, urea, creatinine, and a complete blood count with differential. Additional tests may be required based on the patient's overall health. These evaluations are crucial for the anesthesiologist's consultation and to ensure the procedure can be performed safely, minimizing general risks.

It is also essential for the patient to provide a complete list of medications they are taking, specifying whether they are prescribed or used regularly. In general, prescribed medications should be taken on the morning of the surgery unless the doctor advises otherwise. Any allergies, especially to medications or substances used in surgical procedures (e.g., anesthetics or disinfectants), must be reported.

On the day of the surgery, the patient must arrive **fasting**. They will be positioned on a surgical bed specifically designed for ocular procedures.

Anesthesia

To ensure maximum comfort, the surgery is typically performed under **local anesthesia**, combined with light sedation to help the patient relax. Local anesthesia involves injecting an anesthetic near the eye, a procedure comparable to a dental injection: it involves a brief prick, which may be slightly uncomfortable but is very short-lived. Once administered, the patient will not feel pain during the procedure but may sense the surgeon and assistants touching their face or light pressure during certain stages of the surgery.

A common concern is the fear of "seeing" the surgery, as it is performed under local anesthesia. This fear is unfounded: the combination of intense light from the microscope and instruments, along with the effect of the anesthetic, blinds and disables the eye, preventing any clear perception of what is happening. Initially, the patient may perceive shadows or movements, but as the anesthesia takes effect, the eye may temporarily lose all visual function, which typically resolves a few hours after the surgery.

For particularly anxious patients or those with complex clinical conditions, **general anesthesia** may be used to provide an even calmer experience.

After the anesthesia is administered, the area around the eye is carefully disinfected, and the face is covered with a sterile drape that leaves an opening for the treated eye. A device called a **speculum** is used to hold the eyelids open, allowing the surgeon to operate without obstruction.

Procedure

A vitrectomy performed solely for floaters typically lasts about 30 minutes.

The surgeon begins by making **three or four tiny incisions** in the sclera (the white part of the eye) (*For further details, see Appendix 4: Vitrectomy—A "Minimally Invasive" Surgery?*). These incisions, called **sclerotomies**, are very small (less than one millimeter) and allow the insertion of miniaturized surgical instruments, such as:

- A vitrector, which cuts and aspirates the altered vitreous.
- An endolight, which illuminates the retina to enable precise surgery.
- An infusion cannula, which maintains stable intraocular pressure during the procedure.
- A chandelier, an additional light source.

Removal of the Vitreous (For further details, see Appendix 5: Total or Partial Vitrectomy?)

Once inside the vitreous cavity, the surgeon removes the central portion of the vitreous. If the posterior vitreous is still attached, the surgeon gently detaches it from the retina (inducing posterior vitreous detachment surgically). To enhance visibility of the vitreous cortex and filaments, a dye such as **triamcinolone** may be used to stain the vitreous, making its removal easier.

As the vitrector removes the vitreous, the empty space is immediately replaced with a **balanced salt solution (BSS)** to prevent any risk of the eye "collapsing," a common but unfounded concern among patients.

After the central vitreous is removed, the surgeon performs **shaving** of the peripheral vitreous, removing as much as possible to minimize residual floaters and prevent potential post-operative complications.

Retinal Examination and Treatment

Once the vitreous has been completely removed, the surgeon carefully examines the retina for any lesions, tears, or weak areas. If untreated, these could increase the risk of retinal detachment during the post-operative period. Tears or lesions are immediately treated with **laser photocoagulation**, which reinforces the retina and prevents future complications.

It is worth noting that retinal tears occurring during surgery are not inherently dangerous. If identified and treated promptly with a laser, they pose no post-operative risk, are asymptomatic, and are entirely invisible to the patient.

However, **retinal tears that develop spontaneously during the post-operative period**, particularly if the vitreous has not been completely removed, represent a significant risk for retinal detachment. This underscores the importance of thorough peripheral vitreous removal during the procedure.

Vitreous Replacement

At the end of the procedure, the surgeon decides whether to fill the vitreous cavity with **balanced salt solution** or **air**, depending on clinical needs. Air is often used in specific situations, such as:

- Stabilizing retinal tears treated with a laser.
- Maintaining optimal intraocular pressure post-operatively.
- Facilitating sclerotomy closure when sutures are not used.

If air is used, the patient may experience significantly **blurred vision** in the following days. This effect is normal and occurs because the air inside the eye distorts vision. The air is gradually reabsorbed by the body within about a week, after which the vitreous cavity is replaced by the eye's natural intraocular fluid.

During this period, it is crucial to observe the following precautions:

- Driving is not allowed while air is present in the eye.
- Flying or rapid altitude changes (e.g., mountain travel or fast elevators) are strictly prohibited, as pressure changes can cause serious complications, including critically elevated intraocular pressure.

Recovery

After the procedure, the eye is bandaged, and the patient can go home the same day, provided they are accompanied. At home, patients are generally advised to rest for 1-2 weeks and avoid intense physical activities, such as sports, for approximately a month.

For the first **3–5 days** post-surgery, the surgeon may recommend specific head positions, such as avoiding lying flat on the back and using one or two pillows to keep the head elevated.

The typical post-operative care plan includes:

- **Regular use of antibiotic and anti-inflammatory eye drops** to prevent infection and reduce inflammation.
- Scheduled follow-ups to monitor recovery, usually at one day, one week, and one month after the surgery.

Full recovery takes a few weeks, during which vision gradually improves. Following the surgeon's instructions and avoiding strenuous activities are critical to prevent complications such as infections or inflammation.

Limitations of Complete Vitrectomy

While vitrectomy is a highly effective procedure, even when performed perfectly, it has certain inherent technical limitations due to the structure and function of the eye. Patients should be aware of these limitations to maintain realistic expectations about the outcomes of the surgery.

Incomplete Removal of Peripheral Vitreous

The vitreous base adheres tightly to the retina, making its complete removal impossible. In rare cases, particularly sensitive patients may notice residual peripheral vitreous floaters even after a complete vitrectomy.

Residual Dye

During the procedure, dyes may be used to highlight the vitreous and facilitate its removal. Small amounts of residual dye may remain in the vitreous cavity. While these residues are typically reabsorbed naturally within weeks or months, they may cause temporary visual disturbances in the short term.

Non-Vitreous Symptoms

Vitrectomy cannot address visual conditions unrelated to the vitreous, such as:

Visual snow: A persistent disturbance resembling "television static."

Afterimages: The persistence of images after exposure to bright light.

Flashes: Caused by other retinal or neurological conditions.

Post-Operative Expectations

Patients should be informed that, even after a complete vitrectomy, they may continue to notice mild opacities or vitreous remnants. However, these symptoms are generally much less pronounced than those experienced before surgery and, in most cases, do not significantly impact visual quality.

Risks of Vitrectomy for Symptomatic Vitreous Floaters (SVF)

Like any surgical procedure, vitrectomy for **symptomatic vitreous floaters (SVF)** carries certain risks. While these risks are similar to those associated with vitrectomy for other indications, they take on particular significance in this context because eyes affected by SVF are generally healthy or exhibit only minor visual alterations.

As a result, any post-operative change in vision may be perceived by the patient as a significant alteration compared to their pre-operative state. This impact can feel relatively greater than in cases where vitrectomy is performed for more severe, inherently debilitating conditions.

The most serious risk, though rare, is the **complete loss of visual function**, which may occur due to complications such as **intraocular infections (endophthalmitis)** or **structural damage to the eye**. Since the eye is typically healthy to begin with, it is crucial to carefully evaluate the necessity of the procedure, weighing the potential benefits against the associated risks.

Major Risks of Vitrectomy

Severe and Rare Complications

- Retinal Detachment, Endophthalmitis (Intraocular Infection), and Macular Hole: These complications are extremely rare (1 in 1,000 procedures) but can cause permanent damage and require additional surgical interventions.
 - Endophthalmitis typically occurs within 3–4 days post-surgery.
 - **Retinal detachment** and **macular holes** can develop weeks or months after the procedure.

Peripheral Retinal Tears:

These are relatively common and usually asymptomatic unless located near the retinal center, where they may cause scotomas (fixed dark spots in the visual field).

• Such tears are typically treated with laser therapy but, in very rare cases, can leave permanent effects.

Surgical Damage

• Lens Damage:

The lens can be injured during the procedure, leading to the development of iatrogenic cataracts (rapid opacification). This necessitates subsequent surgery to replace the lens with an artificial one.

• Optic Nerve Damage:

Rarely, surgical maneuvers may damage the optic nerve or adjacent retina, resulting in permanent scotomas.

• Hypotony Maculopathy:

Excessively low intraocular pressure post-surgery can cause irreversible damage to the macula, leading to visual reduction and image distortion.

Inflammation and Pressure Issues

• Bleeding, Inflammation, and Elevated Intraocular Pressure:

These are frequent but typically temporary and resolvable with medical treatment, usually without lasting effects.

• Glaucoma:

While no definitive evidence links vitrectomy to glaucoma, intraocular pressure and optic nerve health should be monitored over time.

Cataract Formation

- Cataract development is nearly inevitable following vitrectomy, especially in patients over 50 years old.
 - On average, cataracts develop within 6–48 months post-surgery, though this timeframe may vary.
 - In younger patients (<40 years), cataracts may take over 10 years to form.
 - While cataracts can be resolved with subsequent surgery, this change is an important consideration.

Pupil and Accommodation Issues

• Mydriasis (Pupil Dilation):

The pupil may remain dilated temporarily or, in rare cases, permanently.

• Accommodation Difficulties: Younger patients may experience challenges focusing on near objects post-surgery.

Risk Mitigation and Considerations

While the risk of severe—and particularly permanent—complications is rare, it is essential to carefully evaluate these risks in the context of the potential benefits. Most complications are preventable with meticulous surgical technique, proper patient selection, and adherence to postoperative care guidelines.

Patients should have a clear understanding of these risks and engage in an open discussion with their surgeon to make an informed decision. In many cases, the decision to proceed with vitrectomy is justified only when the expected benefits significantly outweigh the potential risks.

Postoperative Course

The postoperative recovery from a vitrectomy for vitreous floaters, when well-performed, is generally brief, with rapid improvement in vision free from the disturbances caused by the floaters. However, recovery varies depending on several factors, such as the use of air or gas in the eye, the application of dyes during surgery, or the concurrent extraction of cataracts and implantation of an artificial lens.

Phases of Postoperative Recovery

1. Use of Air or Gas

• Visual Impact:

If air was injected during the procedure, vision will be blurred for about 7-10 days, as the presence of air prevents clear sight.

- Limitations:
 - While air is in the eye, patients cannot drive, fly, or travel to high altitudes (mountains or airplanes) until the air is fully absorbed.
- Initial Symptoms:
 - Patients may experience unusual reflections, beams of light, or bothersome flashes.
 - Air tends to resorb upwards but is perceived by the patient in the lower part of the visual field.

• After about three days, it is usually possible to see straight ahead, though reading may require complete resorption of the air.

2. Vision Recovery

• Early Vision:

Regardless of whether air is used, vision may not be fully clear for the first 2–3 weeks.

- Recovery Timeline:
 - Vision typically returns to normal within 3–4 weeks, although in some cases it may take longer.
 - Delays can be caused by inflammation, dryness, or minor complications such as residual blood, which may take weeks to stabilize.

• Complete Recovery:

 Within 1–2 months, most patients experience nearly complete recovery of visual quality, barring specific complications.

3. Postoperative Residuals

• Transparent Filling:

After surgery, the eye is filled with a clear liquid rather than the original gel-like vitreous. As a result, any impurities in the eye—such as dye residues, pigments, inflammatory cells, or blood—can move freely.

• Absorption Timeline:

 Most of these residuals resolve spontaneously within 3–4 weeks, though some may take longer.

• Residual Opacities:

• Occasionally, residual particles can aggregate into larger floaters. However, these typically disappear over time.

Expectations and Recommendations

A vitrectomy for vitreous floaters generally allows for relatively rapid visual recovery. However, patience is required during the initial weeks to overcome any transient disturbances.

• Regular Follow-Ups:

Regular postoperative check-ups with the surgeon ensure timely resolution of concerns and address any issues promptly.

• Optimal Outcome:

Maintaining communication with the medical team and adhering to prescribed care will help ensure a smooth recovery and excellent visual outcomes.

Giulio Bamonte, 25-11-2024

Appendix 1: Posterior Vitreous Detachment (PVD)

What is PVD?

Over time, the liquefaction of the vitreous (vitreous degeneration) can lead to **posterior vitreous** *detachment (PVD)*, where the vitreous cortex separates from the retina. PVD is considered complete when the cortex detaches from both the macula and the optic nerve head.

The term **partial vitreous detachment** is often misleading. This "partial" detachment begins at a young age and simply signifies ongoing vitreous degeneration. It is more accurate to distinguish between a vitreous that is still attached and one that is completely detached (PVD).

Symptoms of PVD: Recognizing Them Can Save Your Vision!

PVD typically presents with:

- *Sudden onset of floaters*, perceived as shadows, strands, or cobwebs floating in the visual field.
- Flashes of light in the affected eye.

PVD can cause **retinal tears**, which, if untreated, may progress to retinal detachment—a severe condition requiring emergency surgery.

Average Age and Risk Factors for PVD

PVD typically occurs between the ages of 55 and 65, but:

- In highly myopic individuals, it may occur as early as their 40s.
- It is rare in people in their 20s or 30s unless triggered by trauma, surgery, or genetic predispositions.
- Even individuals over 65 can develop PVD.

Young individuals who experience floaters may mistakenly believe they have PVD and are at risk of retinal detachment. However, such cases are highly unlikely.

What to Do If PVD Symptoms Appear

Upon experiencing symptoms (sudden floaters and flashes of light), it is essential to urgently visit an ophthalmologist to undergo a **fundus examination** to:

- 1. Confirm whether the vitreous has completely detached.
- 2. Identify any retinal tears.

If retinal tears are present, they must be treated promptly with **laser photocoagulation** to prevent retinal detachment. If the retina remains intact, no intervention is needed, but a follow-up examination is recommended to ensure no new tears develop.

Symptom Progression in PVD

One month after the acute onset of PVD, the risk of new retinal tears becomes statistically improbable. However:

- *Flashes of light*, initially intense, may persist for weeks or months, particularly in low-light conditions. This phenomenon is normal and does not indicate continued traction on the retina.
- *Floaters*, on the other hand, may remain visible indefinitely, especially in bright conditions.

Appendix 2: Selection Bias and Confirmation Bias

Selection Bias

Selection bias occurs when a person begins to focus on a specific phenomenon, unconsciously selecting only those stimuli that confirm its presence. In the case of vitreous floaters:

- A person may notice them for the first time following a triggering event, such as a change in lighting, visual stress, an unrelated illness, or a conversation with someone who mentioned experiencing floaters.
- After this initial event, they begin to concentrate on the floaters, ignoring other visual stimuli they previously perceived normally. Their perception becomes filtered by their new awareness of the issue.

In essence, the brain "selects" the floaters, bringing them into focus, whereas previously they were ignored or perceived as insignificant.

Confirmation Bias

Confirmation bias, on the other hand, comes into play later, when a person actively seeks evidence to support an existing suspicion or fear. In the case of vitreous floaters:

- The person may think, "My floaters are getting worse."
- This thought drives them to focus intensely on the floaters, actively looking for them in various lighting conditions or against uniform surfaces (such as the sky or a white screen).
- Each time they notice a floater, they interpret its presence as confirmation of worsening, even if there has been no actual change in the number or size of the floaters.

Practical Example

- Selection Bias: A young person notices floaters for the first time while looking at the sky and starts thinking about them constantly. Every time they observe light or clear surfaces, they unconsciously search for the floaters.
- **Confirmation Bias:** Convinced that their floaters are increasing, they interpret every observation as evidence of worsening, despite the floaters remaining stable.

Impact on Anxiety and Discomfort

This cycle of selective attention and subjective confirmation can amplify anxiety and discomfort associated with floaters, worsening the perception of the condition.

Appendix 3: SVF—A Syndrome Rather Than a Symptom?

Symptomatic Vitreous Floaters (SVF), traditionally considered a symptom, can sometimes manifest as part of a more complex condition, resembling a multifactorial syndrome. This is because many SVF patients exhibit heightened visual and perceptual sensitivity, making them particularly prone to noticing not just floaters but also other visual disturbances or associated symptoms.

Additional Symptoms Reported by SVF Patients

Visual Symptoms:

- Visual Snow: Characterized by the perception of "visual noise" or a shimmering haze, akin to television static.
- Afterimages: Persistent perception of images after the visual stimulus is removed.
- Halos and streaks around lights: Visual phenomena that often worsen in low-light conditions, such as at night.
- *Photophobia: Excessive light sensitivity, which can exacerbate discomfort associated with floaters.*

Non-Visual Symptoms:

- Tinnitus: Perception of sounds such as ringing or buzzing in the ears, often linked to heightened overall sensory sensitivity.
- Anxiety or stress: Commonly reported and may intensify the perception of floaters and other visual symptoms.

Amplified Visual Sensitivity

This hypersensitivity appears to be a common trait among SVF patients, suggesting that the condition is not simply a mechanical issue caused by vitreous opacities but rather a more complex sensory condition.

For example:

- Many patients with SVF describe their symptoms as intolerable or disabling, even when clinical evaluation might consider them mild.
- Others report difficulty adapting to visual environments that most people consider normal, such as bright or variable lighting conditions.

Possible Physiological and Psychological Correlations

This amplified sensitivity may arise from a combination of factors:

- Neurological alterations: The brain may have a reduced ability to filter out "non-essential" visual signals, amplifying the perception of phenomena like floaters.
- Sensory comorbidities: Symptoms like tinnitus and visual snow may indicate dysfunction in the body's integrated sensory systems.
- Psychological factors: Conditions such as chronic anxiety or stress can lower tolerance for visual symptoms, making them more intrusive and harder to ignore.

A Broader Diagnostic and Therapeutic Approach

Viewing SVF as part of a possible multifactorial syndrome calls for a more comprehensive diagnostic and therapeutic strategy:

- Multidisciplinary evaluation: Combining ophthalmological exams with neurological and psychological assessments to identify underlying causes or comorbidities.
- Personalized management: Adopting an approach that addresses not only the anatomical component (e.g., the floaters themselves) but also the sensory, emotional, and psychological aspects of the patient's experience.
- Education and reassurance: Helping patients understand that, while their symptoms may feel severe, they often do not indicate progressive or serious ocular pathology and can be managed with adaptation strategies or targeted interventions.

In summary, SVF in some cases seems to form part of a broader clinical picture involving not only vision but also global sensory perception. Recognizing this complexity can help both patients and physicians better understand the nature of the symptoms and develop more targeted and holistic therapeutic strategies.

Appendix 4: Vitrectomy—A "Minimally Invasive" Surgery?

One common source of confusion among patients considering vitrectomy for floaters is the choice of instrument "gauge," specifically which is more suitable or less invasive. Recently, vitrectomy has often been referred to as "minimally invasive," particularly when discussing the use of 25-gauge and 27-gauge instruments. But what does this really mean?

Understanding Gauge

The term **gauge** simply refers to the size of the surgical instruments, and therefore the diameter of the sclerotomies needed to introduce them into the eye.

- 25-gauge instruments require sclerotomies of approximately 0.5 mm in diameter.
- 27-gauge instruments require sclerotomies of approximately 0.4 mm in diameter.

The difference between the two is minimal, and in clinical practice, the surgeon's preference—often based on experience and familiarity with a particular set of tools—typically determines which gauge is used.

Is It Really "Minimally Invasive"?

It's important to clarify that neither gauge can be considered truly **minimally invasive** in an absolute sense. The so-called "minimally invasive" designation refers solely to the fact that smaller sclerotomies, compared to those used in the past (e.g., 20-gauge instruments, with diameters exceeding 1 mm), generally do not require sutures to close at the end of the procedure.

This represents a significant improvement over older techniques, offering enhanced patient comfort and faster post-operative recovery. However, it is not always possible to avoid sutures, depending on the specifics of the procedure.

Key Takeaway

Despite the smaller gauges, the vitrectomy procedure itself remains fundamentally unchanged and cannot be considered completely **non-invasive**. It is still a complex intraocular surgery with the same goals and technical dynamics as always.

Describing vitrectomy as "minimally invasive" can therefore be misleading: the primary advancement lies in the reduced size of the incisions, not in the nature of the procedure itself.

Appendix 5: Total vs. Partial Vitrectomy

Vitrectomy is a highly effective procedure for definitively removing symptomatic vitreous floaters (SVF), providing significant improvements in patients' quality of life. However, to ensure the success of the procedure and minimize risks, it is essential to perform a complete vitrectomy, which includes:

- Inducing posterior vitreous detachment (if not already present).
- *Removing the central vitreous, where most floaters are located.*
- Thoroughly shaving the vitreous base (360 degrees) to eliminate potentially symptomatic remnants.

Advantages of a Complete Vitrectomy

A complete vitrectomy ensures:

- 1. Definitive removal of floaters, preventing recurrence.
- 2. Minimization of symptomatic vitreous remnants (commonly referred to as "frill").
- 3. Reduction in post-operative complications, such as retinal detachment.

Limitations of a Partial Vitrectomy

Partial vitrectomy, where the vitreous is not fully detached or removed, is sometimes considered less complex. However, it has numerous disadvantages compared to the complete technique:

1. Incomplete Removal of the Vitreous

- If the posterior vitreous is not fully detached, floaters may not be completely eliminated.
- Many patients undergoing partial vitrectomy continue to experience symptoms, compromising the effectiveness of the procedure.
- 2. Recurrence and Complications
 - *Retained posterior vitreous can detach later, leading to:*
 - *Recurrence of symptoms.*
 - Delayed retinal detachment, a potentially serious complication.
- 3. Peripheral Vitreous Remnants
 - Incomplete shaving of the vitreous base increases the risk of post-operative retinal detachment by approximately 10 times compared to a thoroughly treated base.
- 4. Unmitigated Risks
 - Infections: The risk of severe infections is the same for partial and complete vitrectomy. Therefore, performing an ineffective partial procedure offers no safety advantage.
 - Cataracts: Cataract formation is a common outcome after vitrectomy, regardless of whether it is partial or complete. Opting for a partial approach does not reduce this likelihood, making a definitive solution more logical.

Key Conclusion

When addressing SVF and vitrectomy, the primary decision is whether or not to undergo the procedure. However, once the decision is made, it is critical to opt for a complete vitrectomy to ensure the best outcomes and minimize the risk of post-operative complications. This approach ensures comprehensive vitreous removal, significantly reducing the likelihood of recurrence and issues related to residual vitreous.