

RESEARCH

Asteroid Bodies in the Vitreous

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Abstract

Asteroid bodies are frequently observed in the vitreous but there are many clinicians who confuse asteroid bodies with synchysis scintillans. This review attempts to clarify the differential diagnosis of these disorders. However, there remains some uncertainty regarding the association of asteroid bodies with systemic disease.

Résumé

On observe souvent des corps astéroïdes dans le vitré de l'oeil, mais de nombreux cliniciens confondent les corps astéroïdes et le synchysis scintillant. L'étude tente d'éclaircir le diagnostic différentiel de ces affections. D'autre part, il demeure une certaine incertitude quant à la relation entre les corps astéroïdes et les maladies générales.

Introduction

Asteroid bodies in the vitreous were first differentiated from other disorders of the vitreous by Benson nearly a century ago¹. He reported the case of a 62-year-old man with complaints of three or four spots before the sight of his right eye and asthenopia. The examination of the patient was unremarkable except the vitreous of the right eye was filled with innumerable fine spheres that Benson called "stars on a clear night". A typical case of asteroid bodies is shown in Figure 1. Unfortunately, Benson named this disorder "asteroid hyalitis" in spite of the fact that there were no signs of ocular inflammation. Subsequently, others criticized this terminology and, as a result, many names were advanced to describe asteroid bodies which included Benson's disease, scintillatio nivea, scintillatio albescens, asteroid hyalopathy, and asteroid hyalosis. We have chosen to use "asteroid bodies in the vitreous", which we feel represents the most descriptive terminology, in this manuscript.

Epidemiology

Although the incidence of asteroid bodies has not been reported, the prevalence (Table 1) has been documented to be from 0.01% to 0.90%²⁻⁷.

Many of the clinical characteristics of the disorder can be tabulated from the 351 cases reported in the

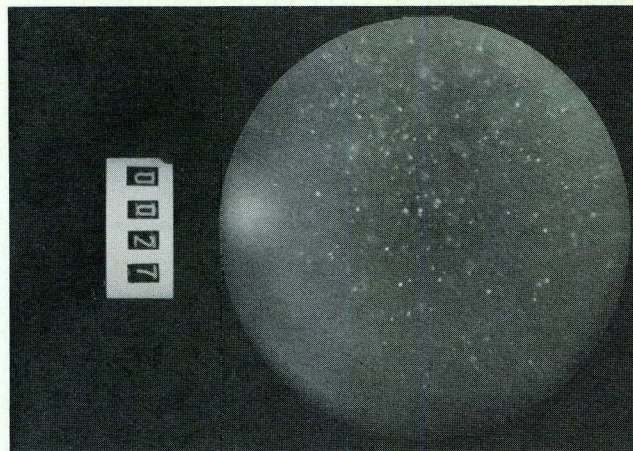


Fig. 1: Asteroid bodies in the vitreous.

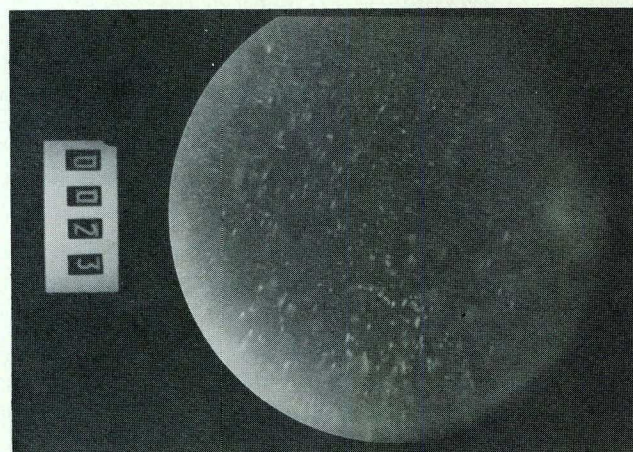


Fig. 2: Symptomatic asteroid bodies in the vitreous.

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Table 1
Prevalence of Asteroid Bodies

Investigator (Year)	Rate	Prevalence (%)
Webster (1884)	5/45,000	0.01%
Dor (1908)	32/82,732	0.04%
Westphal (1915)	40/65,000	0.06%
Gorduren (1948)	16/14,350	0.04%
Hatfield (1962)	32/6,346	0.50%
Potter (1980)	14/1,559	0.90%

literature⁶⁻¹⁵. A calculated-weighted average age was 67 years, with a range from 30 to 96 years. There were slightly more males than females. Almost 90% of the cases were unilateral. There was not adequate data available to ascertain any possible racial factors associated with the prevalence of asteroid bodies in the vitreous.

Symptoms

In spite of the fact that Benson reported a patient who had asteroid bodies with symptoms of floaters, Rutherford declared in an extensive review of the subject that asteroid bodies did not cause any symptoms or visual acuity loss⁹. However, in 1965, Cibus reported two cases that showed very poor visual acuity¹⁶ and in 1976, Yamada and Shimizu also reported two patients with poor visual acuity attributed to asteroid bodies in the vitreous¹⁷. A 70-year-old woman had 20/60 distance visual acuity with her right eye through dense asteroid bodies. The other patient, a 61-year-old woman had 20/200 distance visual acuity with her right eye through dense asteroid bodies and 20/25 distance acuity through a few asteroids in the left eye. In both 1981 and 1983 there were additional reports of patients with asteroid bodies in the vitreous severely impairing vision¹⁸⁻¹⁹. These patients both had vitrectomies in an attempt to improve vision. Recently, we reported four patients who had either floaters, poor visual acuity, or both caused by asteroid bodies in the vitreous¹⁵. One of our patients with symptoms of floaters from that report is represented in Figure 2. Thus it would appear that contrary to many previous publications and many standard textbooks, asteroid bodies in the vitreous may infrequently cause vision symptoms of either floaters, poor visual acuity, or both.

Clinical Features

Although almost universally observable by ophthalmoscopy, the slit-lamp microscope provides the best opportunity for a comprehensive view of asteroid bodies. When they are viewed with direct focal illumination, asteroid bodies appear as smooth, white or yellow, spheres of many sizes. Occasionally, a few asteroid bodies may be pigmented²⁰. They appear black by retroillumination, and often are seen to be arranged as a string of

irregular spheres. Closer examination of these strings of asteroid bodies frequently will reveal that they are arranged along the course of the fibers of the vitreous. Asteroid bodies move about with eye movements, and they are most mobile in eyes with extensive vitreous liquefaction, or in posterior vitreous detachment. They may occasionally appear in the anterior chamber in aphakic eyes²¹. Regardless, asteroid bodies return to their original configuration when eye movements halt, and they do not appear in Cloquet's canal, in liquefied vitreous, or the retrovitreous space²².

Ophthalmoscopically, asteroid bodies appear as white or yellow spheres suspended in an otherwise unremarkable vitreous. The binocular indirect ophthalmoscope can be used to categorize the severity of asteroid bodies in the vitreous⁸. Mild cases demonstrate less than five strands of asteroid bodies; moderate cases have greater than five strands, but not so many that details of the fundus are obscured; and severe cases obscure fundus details. By this taxonomy, most cases of asteroid bodies in the vitreous, in our experience, are moderate. Interestingly, fluorescein angiography of the fundus is not impaired by asteroid bodies in the vitreous because only the emitted fluorescent light is documented on the film^{23,24}. However, they may obscure fundus details making the diagnosis of some fundus diseases more challenging. In fact, severe asteroid bodies in the vitreous may interfere with the visibility of retinal detachments, which may make the surgery more difficult to perform²⁵.

Asteroid bodies progress very slowly, if at all. Only one report has described progression of the disorder. In 1922, Weidler described a 54-year-old woman whose asteroid bodies became more numerous organizing into chain-like formations in an eight year period²⁶. Also, two patients were described as having no asteroid bodies in the vitreous at initial examination, but developed mild asteroid bodies within two years²⁷.

Etiology

Inheritance has been suggested and three reports describing cases of affected siblings with asteroid bodies have been reported^{28,29,30}. The manner of inheritance has not been accurately elucidated, but Wischer suggested that inheritance may have a role in the etiology of asteroid bodies in the vitreous³¹.

Verhoeff felt that the formation of asteroid bodies might be dependent on an intraocular angi sclerosis associated with an altered condition of the blood³². Holloway suggested that the underlying process could be similar to that which produces gallstones³³. Krause believed that they might originate from the lipids of leukocytes³⁴, and Pau felt that they might represent degenerated pigment epithelium cells³⁵. Clapp suggested that syphilis,

tuberculosis and angiosclerosis might be important considerations³⁶. More recently, it has been suggested that a physiochemical shift of portions of normal vitreous from liquid to solid might be responsible for the formation of asteroid bodies³⁷, and Streeten has emphasized that the most likely etiology was exogenous to the vitreous³⁸. The pathogenesis of asteroid bodies in the vitreous has remained elusive.

Histopathology

Histologic observations of asteroid bodies were first documented by Verhoeff³². Asteroid bodies in the vitreous have been described as irregular spheres from 0.1 mm to 1.0 mm in diameter³⁹. Inspection with polarized light has documented minute crystals surrounded and imbedded within an amorphous matrix⁴⁰, and electron diffraction has revealed the crystalline materials to be "satellites" of asteroid bodies containing oxalate monohydrate and calcium hydroxyphosphate³⁷. A study utilizing roentgenographic spectroscopy has revealed sulfur and phosphorus contained in asteroid bodies⁴¹. Although it is often presumed that they occur in an otherwise normal vitreous, there have been a few cases of asteroid bodies reported where histologically there was a foreign body giant cell reaction⁴⁰.

Association with Systemic Diseases

Many systemic diseases and disorders have been reported to be associated with asteroid bodies in the vitreous. Most of them have been summarized by Duke-Elder, and include arteriosclerosis, nephritis, diabetes, syphilis, and tuberculosis⁴². In addition, elevated serum calcium levels have been reported in several patients with asteroid bodies¹⁰. The most rousing discussions have centered about the possible association of diabetes and hypercholesterolemia with asteroid bodies^{11,12}, however, in a case-control study, such suspicions were not confirmed⁸. Recently, there has been some indication of a possible role of vascular diseases and asteroid bodies in the vitreous⁷. At present, the relationship between asteroid bodies in the vitreous and systemic disease still remains at the level of casual association^{9,36}.

Differential Diagnosis

Asteroid bodies in the vitreous present such a striking clinical picture that the differential diagnosis can be limited to only one other vitreous disorder, synchysis scintillans. Standard ophthalmic texts usually compare and contrast asteroid bodies in the vitreous with synchysis scintillans. To summarize these texts, synchysis scintillans is said to present bilaterally in the third decade of life as numerous flat, crystalline flakes in a liquified vitreous^{19,43-47}. The composition of these flakes has been suggested

to be cholesterol, whereas the major chemical composition of asteroid bodies is calcium.

Synchysis scintillans has been compared to asteroid bodies for almost a century without challenge, such that it must be considered in the differential diagnosis of asteroid bodies. Interestingly, only one report questioned synchysis scintillans as a valid clinical entity before 1975²². In that year, a scientific manuscript was published that reported that it had not been possible to document a single confirmed case of synchysis scintillans in this century⁴⁸. It was suggested from this study that synchysis scintillans is an extremely rare condition that occurs in only severely damaged, blind eyes. Synchysis scintillans, as a vitreous disorder occurring in otherwise normal eyes, does not appear to exist^{49,50}. Cholesterosis bulbi, a cholesterol degeneration occurring in severely damaged eyes, does exist as a well-documented clinical condition, which presents no challenge to the differential diagnosis of asteroid bodies. Many professionals may erroneously believe that a bilateral presentation of asteroid bodies in the vitreous is synchysis scintillans. However, our analysis of 335 previously reported cases of asteroid bodies suggests that 10% of cases are bilateral.

Management

Asteroid bodies in the vitreous should not cause us to suspect associated systemic disease until we have a greater knowledge base regarding these suspected associations. For those patients with vision symptoms, we found that it was not possible to diminish the floater symptoms by either dilating or constricting the pupil¹⁵. Thus, the management is merely to monitor the condition.

Conclusion

Asteroid bodies in the vitreous are an extraordinary clinical condition. In spite of the fact that they may be so numerous as to completely obscure the fundus, they rarely cause vision symptoms. Asteroid bodies generally occur later in life, and 90% of cases are unilateral. They are not associated with systemic disease, and it is not necessary to differentially diagnose them from synchysis scintillans. No medical treatment has been demonstrated to alter floater symptoms or poor visual acuity in the few patients with vision symptoms associated with asteroid bodies.

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Continued from p. 42

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Continued on p. 54