

# Asteroid hyalosis

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**PURPOSE.** *This study evaluated ocular and systemic diseases in patients with asteroid hyalosis and compared axial lengths of asteroid hyalosis patients with the normal population.*

**METHODS.** *The examination of 26 patients with asteroid hyalosis consisted of complete history, complete ocular examination, blood pressure and laboratory studies in order to detect systemic diseases, A and B scan ultrasonography to measure axial lengths and to detect posterior vitreous detachment.*

**RESULTS.** *All patients had unilateral asteroid hyalosis; 10 (38.5%) were symptomatic. Eight patients (20.5%) had type II diabetes mellitus, 13 (33.3%) patients had systemic arterial hypertension and 7 (18%) had atherosclerotic heart disease; 5 (12.8%) had hyperlipidemia and 6 (15.4%) had hypercholesterolemia. Posterior vitreous detachment was found in 3 (11.5%) patients with asteroid hyalosis, and 6 patients in the control group (23.1%) had posterior vitreous detachment ( $p < 0.01$ ). In patients with asteroid hyalosis, the mean axial length difference between two eyes was  $0.32 \pm 0.06$ , against  $0.10 \pm 0.02$  in the control group ( $p < 0.01$ ).*

**CONCLUSION.** *Asteroid hyalosis may be found together with systemic diseases and such patients must be evaluated systematically for diabetes mellitus, hypertension and hyperlipidemia. Asteroid hyalosis can also cause artefactual lowering of axial length measurement, leading to significant error in calculations of intraocular lens power. This must be kept in mind before cataract surgery. (Eur J Ophthalmol 2001; 11: 57-61)*

**KEY WORDS.** *Asteroid hyalosis, Systemic diseases, Axial length, Posterior vitreous detachment*

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## INTRODUCTION

Asteroid hyalosis (AH) is a common clinical entity in which calcium-lipid complexes are suspended throughout the collagen fibrils of the vitreous (1-4). Benson, in 1894, was the first to describe accurately and to differentiate AH from synchysis scintillans. Because the vitreous particles resembled "stars on a clear night" he termed the condition asteroid hyalitis, but Luxenberg and Sime later suggested the term "asteroid hyalosis" in view of the absence of inflammatory changes (5). AH is usually seen unilaterally in patients over 60 years of age. It has no sex or race predisposition and the reported incidence in the general population is 0.5% to 0.9% (1,3,5,6).

A number of studies have suggested relationships between AH and systemic conditions including hypercholesterolemia, hyperlipidemia, hypercalcemia, hyperuricemia, atherosclerotic heart disease, hypertension and diabetes mellitus (5,7-9). However no ocular or systemic condition has been consistently associated with AH (5,7,8).

Patients with AH are usually asymptomatic, but they may complain of decreased visual acuity, glare and floaters. Light scattering by the asteroid bodies occasionally impedes fundus visualization and fundus fluorescein angiography may provide a better assessment of fundus details (1-4,8,10). AH can also interfere with A-scan ultrasonic measurements of axial length before cataract surgery (3,11,12).

The goal of our study was to evaluate ocular and systemic diseases in patients with AH and to compare their axial lengths with a normal population.

## METHODS

We randomly chose 26 patients with AH from our clinic population for inclusion in this study. The controls were chosen from the hospital staff and among patients referred to the department for any ocular diseases matched, as closely as possible, with the AH patients for age, sex and race. These patients had neither refraction error nor refraction difference of more than 1 diopter between two eyes.

The examination of AH and control patients consisted of a detailed history of systemic and ocular diseases, family history, blood pressure, drugs patients were using, best corrected visual acuity, biomicroscopic examination, intraocular pressure, fundus evaluation with +90 diopter lens and three-mirror lens after pupil dilation. In all patients axial lengths (AL) of both eyes were measured with A scan ultrasonography, with contact and manual technique, and posterior vitreous detachment (PVD) was detected with B scan ultrasonography by one of us (ZY). The Mentor/Teknar Ophthasonic Ophthalmic Ultrasound A scan/B scan III Plus with 8 MHz/10 MHz probe frequencies was used.

All laboratory tests were done at the Ankara Numune Hospital laboratories. Serum glucose, total lipids, cholesterol, triglycerides, calcium (Ca) and phosphorus (P) levels were studied in all patients.

The demographic characteristics of the AH group and controls were similar. Patients with AH were between 55-80 years (mean 65, median 69); 16 (61.5%) were male and 10 (38.5%) female, giving a male/female ratio of 2:3. Controls were aged 57-78 years (mean 67, median 68.5). There were no sig-

nificant differences between patient and control groups (Tab. I).

Patients whose serum glucose levels were higher than 110 mg/dl and patients who were known to have diabetes mellitus or were under treatment for diabetes were accepted as diabetics. Patients whose blood pressures were higher than 140 mmHg systolic and 90 mmHg diastolic after three repeated measurements or patients under antihypertensive treatment were accepted as hypertensive.

Axial lengths of two eyes in the study and control groups were calculated with A scan ultrasonography and differences between two eyes were recorded. Mean AL differences were compared with unpaired Student's t-test. The PVD ratio of study and control groups was compared with the chi-square test.

## RESULTS

AH was unilateral in all the patients. The right eye was involved in 12 (46%) patients, the left in 14 (54%). Eight AH patients (31%) had type II diabetes mellitus; 3 were using insulin and 5 were under control with oral antidiabetics. Other concomitant conditions are listed in Table II. Calcium and phosphorus levels were normal in all patients.

Eight patients (31%) had floaters and two (8%) had glare complaints; 16 (62%) were asymptomatic. Visual acuities ranged from 10/10 to count fingers. On biomicroscopic examination, 8 patients were found to have cataractous lenses. Fundus examination findings are summarized in Table III. PVD detected by B scan ultrasonography in the AH and control groups is described in Table IV. The difference between two groups was significant ( $p < 0.01$ ).

Axial length was shorter in patients with AH, the difference between the two groups being significant ( $p < 0.05$ ) (Tab. V).

**TABLE I - DISTRIBUTION OF 26 ASTEROID PATIENTS BY AGE AND SEX**

Age	Female	%	Male	%	Total
50-59	1	4	1	4	2
60-69	6	23	6	23	12
70-79	2	8	6	23	8
80-89	1	4	3	12	4
	10	39	16	62	26

**TABLE II - SYSTEMIC DISEASES SEEN WITH ASTEROID HYALOSIS**

	No.	%
Type II diabetes mellitus	8	31
Systemic arterial hypertension	13	50
Atherosclerotic heart disease	7	27
Hyperlipidemia	5	19
Hypercholesterolemia	6	23

**TABLE III - RETINAL PATHOLOGIES SEEN WITH ASTEROID HYALOSIS**

	No.	%
Diabetic retinopathy	3	12
Hypertensive retinopathy	9	35
Branch retinal vein occlusion	1	4
Age related macular degeneration	2	8

**TABLE IV - POSTERIOR VITREOUS DETACHMENT IN ASTEROID HYALOSIS PATIENTS AND CONTROLS**

	AH group		Control group	
	No.	%	No.	%
Total PVD	1	4	5	19
Partial PVD	2	8	1	4
Total	3	12	6	23

**TABLE V - MEAN AXIAL LENGTH DIFFERENCE BETWEEN EYES IN THE ASTEROID HYALOSIS AND CONTROL GROUPS**

	Mean AL difference (mm)	t
Asteroid hyalosis	0.32 ± 0.06	2.892
Controls	0.10 ± 0.02	2.179

## DISCUSSION

Asteroid hyalosis is a well known clinical entity whose etiology and pathogenesis are not yet clear. Asteroid bodies are composed of multilaminar membranes typical of complex lipids, especially phospholipids, and AH is associated with calcium-phosphate complexes attached to normal vitreous strands (2,3,8,10,13). The source of the phospholipid and calcium for asteroid formation may be exogenous cell products, such as from inflammation, hemorrhage, or leakage from adjacent vessels. Diabetes mellitus, hypertension and atherosclerosis can all predispose retinal vessels to damage and subsequent leakage (8,10,14).

Transmission electron microscopy disclosed irregular calcific material and complex lipids within the asteroid bodies, while X-ray spectroscopy indicated calcium and phosphorus (2). Quantitative analysis showed 42% Ca, 32% P and traces of aluminum and copper (1,2,13). In our study, serum Ca and P levels were within normal limits. But these levels may not show the asteroid bodies' contents. In patients with diabetic and hypertensive retinopathy, Ca and P levels were not high either, but it is difficult to decide whether these diseases lead to Ca and P leakage because our patient group was so small.

Most patients with AH are asymptomatic and they deny seeing floaters. Noda et al suggested that asteroid bodies close to the retina, or which are larger, are perceived by patients (4). Eight of our patients had floaters, but three had PVD. We therefore think that only five of these patients were really seeing floaters.

AH is closely related to aging. It is rarely seen before 50 years of age. Our patients were between 55-80 years as reported in the literature. Vascular and microvascular changes also tend to increase during this period. One of the diseases affecting the microvascular structure is diabetes mellitus (DM). The relationship between AH and DM has been widely studied. Luxenberg and Sime evaluated 100 patients with AH but found no association with systemic diseases (5). The prevalence of diabetes in patients with AH was found to be 25% by Wasano et al, 28% by Hatfield et al, 27% by Bard and 29% by Bergren (7, 8, 14, 15). In our study, the prevalence of type II diabetes mellitus in the AH group was 31%, compared to 7.8% and 17% in a normal population aged 60-65 years (6, 16).

It thus appears that the prevalence of DM in AH pa-

tients is higher than in the normal population, but larger series are needed to permit a firmer conclusion.

AH is also apparently related to systemic vascular disease (5,7,8). In Bergren's study the prevalence of systemic arterial hypertension was 60% in the AH group and 29% in controls (8). In our study 50% of patients with AH had hypertension. But in the normal population between 56-65 years of age hypertension was found in 23.75% of males and 3.5% of females (6). This higher prevalence of hypertension and diabetes also correlates with a higher prevalence of atherosclerotic vascular disease (8), which was found in 27% of our patients. It was present in 30% of the patients with AH, compared to 13% of control patients in Bergren's study (8).

The prevalence of hypercholesterolemia was found to be 69.5% by Smith, 61% by Agarwal and 46.6% by Bard (7, 17, 18). We found hypercholesterolemia in 23% of our patients.

Fundus pathologies may be seen together with AH (8). We found diabetic retinopathy in three AH patients (12%), hypertensive retinopathy in nine (35%), and one patient with branch vein occlusion had also hypertension.

A small percentage of patients with AH have decreased visual acuity caused solely or primarily by the AH. Vitrectomy in these patients may alleviate symptoms and improve visual acuity if there is no other causal ocular pathology (19). Other indications for pars plana vitrectomy (PPV) in patients with AH include improved fundus visualization for diagnostic purposes, prolapse of asteroid body-laden vitreous into the anterior chamber during or after cataract extraction, inability to find retinal breaks in rhegmatogenous retinal detachment, and inability to perform laser treatment of the posterior segment (3). We did PPV in two patients. One of them had diabetic retinopathy and PPV was done for laser treatment. The other patient had suspected choroidal neovascular membrane with age-related macular degeneration and PPV was done for fundus fluorescein angiography.

AH has an ultrasonic appearance on A scan imaging consisting of multiple mid-vitreous peaks on the baseline. With B scan imaging the asteroid bodies are seen as multiple, discrete, small echogenic opacities in the mid-vitreous region, varying in density (20).

In the normal adult population the prevalence of total PVD is 12%, and the prevalence of partial PVD is 31%, while this increases to 66% in aphakic eyes (21). In our AH patients PVD was found in 11.5% (3.8% total, 7.7% partial), and 23.1% in controls (19.3% total, 3.8% partial). The prevalence of PVD was significantly lower in patients with AH than in controls. PVD can be considered part of the aging process, and gel liquefaction and weakness of the vitreoretinal juncture may be important in its course. As positive correlations have been reported, between liquefaction and PVD and between liquefaction and age the low prevalence of PVD in eyes with asteroid bodies after 70 years of age may be related to a low prevalence of liquefaction. Wasano et al concluded that AH has a protective effect against vitreous liquefaction which prevents PVD. An alternative explanation is that the posterior vitreoretinal interface may be important for the formation of AH (14).

AH may also affect intraocular lens (IOL) power calculations by influencing AL measurements (12). A difference of 1 mm in AL will affect postoperative refraction by approximately 2.5 diopters. Axial length measurement is also important in checking certain conditions such as microphthalmus, nanophthalmus, axial myopia, congenital glaucoma, phtisis bulbi and pseudoexophthalmus. AL measurements can be affected by macular edema, disciform scar, tumor, retinal detachment, PVD, posterior staphyloma and coloboma (11, 20). In our study we found AL of eyes with AH were shorter than other eyes of the same patients and of the control group. Ocular pathologies such as PVD in three patients and age-related macular degeneration in two were bilateral and their refraction error was not significant. We accepted AH as responsible for the shorter AL.

Allison also reported falsely short AL measurements using automated biometry in 20 unilateral AH patients (25%) (11). Hartstein reported a patient whose AL was 2.5 mm shorter than predicted in the eye with AH (12). Absorption of ultrasonic waves by the calcium in asteroid bodies can alter sound velocity in the vitreous. This explains the falsely decreased AL measurement. The ophthalmologist should therefore be aware of factors which may yield spurious measurements.

Diabetes mellitus, hypertension, atherosclerotic heart disease and hyperlipidemia are more commonly seen

in patients with AH. These patients must therefore be evaluated for systemic diseases and axial length of eyes with AH must be carefully measured before cataract surgery.

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