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Original Article

Ophthalmology Section

Clinical Profile of Cataract Patients with Asteroid Hyalosis in a Tertiary Care Centre: A Retrospective Observational Study

RAVEENA JEYABALAN[1], T SANGEETHA[2], T KAVYA[3]

ABSTRACT

Introduction: Asteroid Hyalosis (AH) is an asymptomatic degenerative ocular condition of the vitreous associated with old age. Since vision is rarely affected, the focus is on clinical challenges in impaired optical biometry from light scatter and obscured fundus reflex caused by dense asteroid bodies during cataract surgery and subsequent visual outcomes.

Aim: To study the associated factors, visual outcomes and complications in cataract patients with AH.

Materials and Methods: This retrospective observational study included 45 patients with AH who underwent cataract surgery at the Ophthalmology Department of RL Jalappa Hospital and Research Centre in Sri Devaraj Urs Academy of Higher Education and Research, Kolar, Karnataka, India. Medical records from January 2023 to June 2024 were reviewed for demographic details, associated factors, axial length, visual outcomes and postoperative complications. Data analysis was performed using Statistical Package for the Social Sciences (SPSS) version 22.0, with the paired t-test applied to assess mean differences in visual acuity before and after surgery. A p-value of <0.05 was considered statistically significant.

Results: The majority of patients were aged between 65 and 74 years (40.0%) and were predominantly normotensive (77.8%), non diabetic (71.1%), non smokers (93.3%), and reported no alcohol use. Visual acuity significantly improved postoperatively from a preoperative mean of 1.15±0.64 to 0.11±0.13 at one month follow-up (p-value<0.001). Common complications observed included striae keratopathy (28.9%) and intraocular lens (IOL) pigment dusting (11.1%). A significant inverse correlation was found between axial length and postoperative refraction (r-value=-0.373, p-value=0.012).

Conclusion: In this older cohort, cataract surgery significantly improved visual acuity at one month. Mild complications included striae keratopathy and IOL pigment dusting. An inverse correlation between axial length and postoperative refraction observed which reinforces the importance of accurate biometry and potentially adjusted IOL power selection in these patients.

Keywords: Axial length, Cataract surgery, Hypertension, Intraocular lens, Visual acuity

INTRODUCTION

The AH is a benign vitreous condition characterised by the presence of numerous small, refractile calcium and phospholipid deposits within the vitreous body. AH, also known as Benson's disease, was first described in 1894 by Irish ophthalmologist Alfred Hugh Benson as distinct from synchysis scintillans. It typically affects individuals aged 60 to 65 years, is usually unilateral (75-94% of cases), and has a global prevalence of 0.3-2% [1]. While often asymptomatic, AH can present challenges during cataract surgery, affecting both preoperative assessments and intraoperative procedures. It can interfere with autorefraction by creating a reference point within the vitreous rather than the retina, leading to falsely hyperopic results [2]. A-scan ultrasound in eyes with AH may yield falsely short axial length measurements due to early echoes from asteroid bodies, potentially resulting in significant errors in IOL power calculations [3].

The presence of asteroid bodies can cause reflections that obscure the posterior capsule, complicating surgical procedures. Also, during cataract surgery, these bodies might migrate into the anterior chamber, leading to potential complications such as vitreous wicking syndrome. In rare instances, patients may experience reduced visual acuity postsurgery due to clustering of asteroid bodies, which can be alleviated through vitrectomy [4]. Although AH rarely leads to visual complaints, the condition may be a significant obstacle to the performance of fundus examination, particularly screening methods for diabetic retinopathy [5,6]. Additionally, there is a paucity of studies evaluating the impact of AH on IOL power calculation. Hence, present study aimed to study the clinical profile of cataract patients with AH who underwent cataract surgery in our set-up.

MATERIALS AND METHODS

This retrospective observational study was conducted on 45 cataract patients who fulfilled the inclusion criteria in the Department of Ophthalmology at RL Jalappa Hospital and Research Centre in Sri Devaraj Urs Academy of Higher Education and Research, Kolar, Karnataka, India. After obtaining approval from the Central Ethics Committee (SDUAHER/KLR/R&D/CEC/S/PG/35/2024-25, dated 18/07/2024), the medical records of cataract patients with AH who underwent small incision cataract surgery from January 2023 to June 2024 were reviewed and analysed in July 2024.

Inclusion criteria: All cataract patients with AH were included in the study.

Exclusion criteria: Patients with corneal pathologies (such as corneal opacity and dystrophies), retinal pathologies (including diabetic and hypertensive retinopathy), vitreous haemorrhage, and other ocular conditions that could cause decreased vision were excluded from the study.

Study Procedure

Patients were assessed for age, gender, associated factors (hypertension, diabetes mellitus, smoking, Ischaemic Heart Disease (IHD) and alcohol consumption) and investigations (blood pressure, random blood sugar, glycated haemoglobin, blood urea and serum creatinine). Data collected included axial length, initial and final Best Corrected Distance Visual Acuity (BCVA) obtained at one week and one month follow-up, lens (IOL) power, postoperative refractive error and complications.

Patients were considered hypertensive if they had a documented history of hypertension, were using antihypertensive medications, and/or had a systolic and/or diastolic blood pressure above 120/80 mmHg, according to the American Heart Association (AHA) guidelines [7]. A subject was classified as diabetic if he/she had a history of diabetes mellitus, were being treated with insulin or oral hypoglycaemic agents, or had a random blood glucose level ≥200 mg/dL, in line with the American Diabetes Association (ADA) criteria. Diabetes was also diagnosed based on a fasting blood glucose level >126 mg/dL or a glycated haemoglobin (HbA1c) value ≥6.5%, with <5.7% considered normal [8]. The normal reference range for blood urea was 7-20 mg/dL [9], and for serum creatinine, the range was 0.59-1.04 mg/dL in women and 0.74-1.35 mg/dL in men [10].

STATISTICAL ANALYSIS

Data were analysed using MS Excel and SPSS version 22.0 (IBM, Somers NY, USA). Categorical variables were presented as frequencies and proportions. The normality of continuous data was assessed using the Kolmogorov-Smirnov and Shapiro-Wilk tests. Pearson's correlation and paired t-test were used to evaluate the mean differences before and after surgery, with p-value<0.05 considered statistically significant.

RESULTS

The characteristics and associated factors of patients diagnosed with AH are summarised in [Table/Fig-1]. The mean age of the patients was 67±9.85 years, with majority in the 65-74 year age group (40.0%), followed by those aged 55-64 years (24.4%), 75 years and older (22.2%), and under 55 years (13.3%).

Characteristics		n (%)
Age (years)	<55	6 (13.3)
	55–64	11 (24.4)
	65–74	18 (40)
	75+	10 (22.2)
Gender	Female	25 (55.6)
	Male	20 (44.4)
Hypertension	Normotensive	35 (77.8)
	Hypertensive	10 (22.2)
Diabetes mellitus	Yes	13 (28.9)
	No	32 (71.1)
Ischaemic Heart Disease (IHD)	Yes	1 (2.2)
	No	44 (97.8)
Smoking	Yes	3 (6.7)
	No	42 (93.3)
Alcohol	Yes	0
	No	45 (100)

[Table/Fig-1]: Characteristics of patients with asteroid hyalosis (N=45).

Females comprised 55.6% of the study population, while males accounted for 44.4%. The majority of individuals were normotensive (77.8%), while 22.2% were hypertensive. Regarding diabetes mellitus, 28.9% had the condition, and 71.1% did not. IHD was reported in only 2.2% of participants, with 97.8% having no history of IHD. A small proportion of the participants were smokers (6.7%), whereas 93.3% were non smokers. None of the participants reported alcohol consumption, with 100% being non drinkers.

[Table/Fig-2] presents the mean±Standard Deviations (SD) of key clinical parameters measured in the study cohort. The mean systolic blood pressure was 117.78±8.23 mmHg, while the mean diastolic blood pressure was 75.78±5.00 mmHg. The average random blood glucose level was 136.96±45.83 mg/dL, and the mean glycated haemoglobin (HbA1c) was 7.53±0.98%. Blood urea levels averaged 25.16±6.94 mg/dL, and serum creatinine concentrations were 0.70±0.22 mg/dL.

Investigations		Mean±SD
BP (mmHg)	Systolic	117.78±8.23
	Diastolic	75.78±5.00
RBS (mg/dL)		136.96±45.83
HbA1c (%)		7.53±0.98
Blood urea (mg/dL)		25.16±6.94
Serum creatinine (mg/dL)		0.70±0.22

[Table/Fig-2]: Clinical investigations across the study sample.

[Table/Fig-3] summarises the changes in visual acuity (logMAR) following surgery. The mean preoperative visual acuity was 1.15±0.64. A significant improvement was observed postoperatively, with the mean visual acuity improving to 0.22±0.25 immediately after surgery (p-value <0.001). Further gains were noted at subsequent follow-up intervals, with mean logMAR values of 0.12±0.13 at one week postoperatively and 0.11±0.13 at one month. All postoperative values showed statistically significant improvements when compared to the preoperative baseline (p-value <0.001 for all comparisons), as determined by the paired t-test.

Visual acuity (logMAR)	Mean±SD	p-value
Preoperative	1.15±0.64	-
Immediate postoperative	0.22±0.25	<0.001* (Pre-op vs Immediate post-op)
Post-op 1 week	0.12±0.13	<0.001*(Pre-op vs 1 week post-op)
Post-op 1 month	0.11±0.13	<0.001*(Pre-op vs 1 month post-op)

[Table/Fig-3]: Comparison of preoperative and postoperative visual acuity paired t-test.

[Table/Fig-4] describes various complications encountered during cataract surgery in the study participants. The most common complication was striae keratopathy. IOL decentration was the least frequent complication. Overall, the complication rates were relatively low and generally manageable with topical steroids and 2% hypertonic saline eye drops. Pigment dusting and mild IOL decentration did not significantly impact the postoperative vision.

Complications	n (%)
Striae keratopathy	13 (28.9)
Pigment dusting on IOL	5 (11.1)
IOL decentration	1 (2.2)

[Table/Fig-4]: Complications encountered during cataract surgery.

[Table/Fig-5] presents a statistical comparison of AL and IOL power between eyes affected by AH and their fellow eyes using an independent t-test. The mean AL was significantly lower in eyes with asteroid hyalosis (22.256±0.779) compared to fellow eyes (22.419±0.817, p-value=0.022). No significant difference was observed in mean IOL power between the two groups (p-value=0.710).

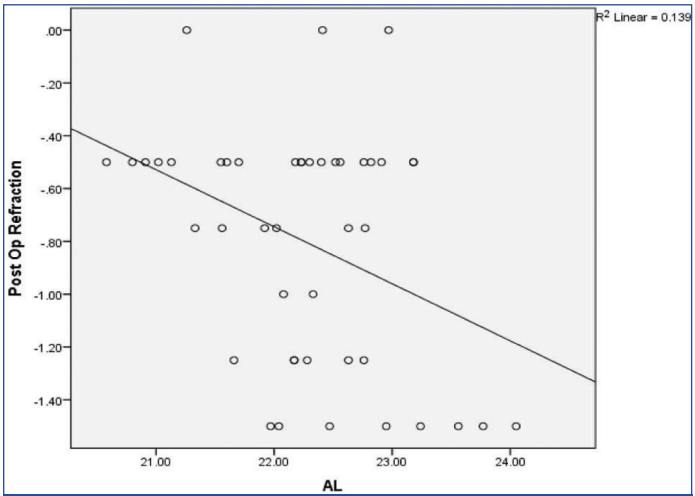
Parameter		N	Mean±SD	p-value
AL	Asteroid hyalosis	45	22.256±0.779	0.022*
	Fellow eye	45	22.419±0.817	
IOL	Asteroid hyalosis	45	22.1333±1.896	0.710
	Fellow eye	45	22.1667±1.942	

[Table/Fig-5]: Comparison of axial length and IOL power between the eye with AH and fellow eye (Independent t-test).

[Table/Fig-6,7] present the Pearson correlation analysis between axial length and postoperative refraction in 45 participants. The analysis revealed a Pearson correlation coefficient of -0.373, indicating a weak to moderate but statistically significant negative

Axial length	N	Postoperative refraction
Pearson correlation	1	-0.373
p-value		0.012*
N	45	45

[Table/Fig-6]: Relation between axial length and post operative refraction by Pearson's correlation (r=0.19.).
Correlation is significant at 0.05 level (2 – tailed)

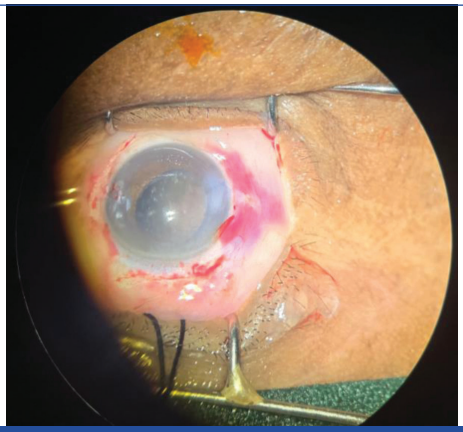


[Table/Fig-7]: Scatter plot showing relation between axial length and postoperative refraction.

correlation (p-value=0.012), indicating that as axial length increases, postoperative refraction tends to shift toward more myopic values.

B-scan ultrasonography of the right eye demonstrated multiple discrete, highly echogenic opacities scattered throughout the vitreous cavity, consistent with AH. The vitreous opacities are non layering, show limited mobility and do not obscure the visualisation of the posterior segment. No evidence of retinal detachment or intraocular mass was seen [Table/Fig-8,9].

[Table/Fig-8]: B Scan of right eye shows numerous low mobile, bright dots that persist with low gain hyperechoic foci within the vitreous.



[Table/Fig-9]: Intraoperative visualisation of asteroid hyalosis in the right eye.

DISCUSSION

The AH is known to be age-related, with prevalence increasing with age. The present data (40% in 65-74 age group and 22.2% in those aged 75 and older) align closely with the findings of other studies, supporting the age-related nature of AH. A systematic review and meta-analysis encompassing nine studies with over 100,000 participants found that the overall prevalence of AH was 0.75%. Prevalence increased with age, from 0.27% in individuals aged 0-39 years to 3.07% in those aged ≥80 years. Additionally, male gender was identified as a significant risk factor, with an odds ratio of 1.80 [11]. Duke-Elders also confirms higher prevalence in elderly patients, with minimal occurrence below age of 50 [12]. The gender ratio shows a slight female predominance (55.6% female vs. 44.4% male), unlike other studies that have reported slight inclination towards males [13,14].

This study examined systemic associated factors among patients with AH, identifying hypertension (22.2%) and diabetes mellitus (28.9%) as the most common associations. These findings are consistent with previous reports linking AH to vascular and metabolic conditions [15,16]. Both studies reported significant associations between AH and hypertension, with rates of 39.4% (p-value=0.019) in the former and noting a prevalence of 60% in AH patients (p-value=0.0001) in the latter. The lower rate observed in present study may be attributed to differences in population characteristics or methodology. Similarly, diabetes prevalence aligns with prior studies, which reported diabetes in 97 (25%) of AH patients [17] and highlighted associations with insulin resistance [18]. These findings support the hypothesis that metabolic dysfunction contributes to the development of asteroid hyalosis.

Interestingly, only 2.2% of the patients had IHD, consistent with literature suggesting no direct link between AH and IHD. Smoking (6.7%) and alcohol consumption (0%) were rare in present study cohort and similarly have not been identified as significant risk factors in recent studies [16,19]. This study also evaluated systemic parameters in cataract patients with AH, highlighting a potential link between the condition and metabolic dysfunction, particularly diabetes mellitus. The mean blood pressures (117.78±8.23 mmHg and 75.78±5.0 mmHg, respectively) suggest most patients were normotensive, consistent with studies such as Beaver Dam study, which showed no significant association between asteroid hyalosis and hypertension [20].

In contrast, glycaemic parameters were notably elevated (RBS: 136.96±45.83 mg/dL; HbA1c: 7.53±0.98%), indicating poor diabetic control. Recent studies, including a large population-based study from Korea, have confirmed a higher prevalence of AH in diabetic individuals [21]. Although direct evidence is lacking, chronic hyperglycaemia-induced oxidative stress and metabolic dysregulation may promote granulomatous inflammation, creating conditions that indirectly support the formation of asteroid body formation [22].

Renal markers (urea: 25.16±6.94 mg/dL; creatinine: 0.70±0.22 mg/dL) remained within normal limits, suggesting no overt renal impairment, although subclinical dysfunction has been associated with ocular changes in other studies due to disruption in calcium-phosphate metabolism [23-25].

Visual acuity improved significantly after cataract surgery in patients with asteroid hyalosis. The mean preoperative logMAR value of 1.15±0.64 improved to 0.12±0.13 at one week and 0.11±0.13 at one month postoperatively (p-value<0.001), indicating substantial visual recovery that aligns with previous studies reporting favourable results in such cases [26-28]. Pearson correlation (r-value=-0.373) indicates a moderate negative correlation between axial length and postoperative refraction in these patients. The scatter plot illustrates the relationship between AL and postoperative refraction, with a fitted linear regression line and r^2=0.139. As AL increases, postoperative refraction tends to be more myopic (or less hyperopic). The p-value

(0.012) [Table/Fig-7] was statistically significant at the 0.05 level (two-tailed), meaning there's a significant relationship between axial length and postoperative refraction. As dense AH can lead to errors in axial length measurement, potentially contributing to refractive surprises postsurgery use of A-scan biometry is recommended in such cases [29]. It is also established that longer axial lengths often result in more myopic refractions, especially in patients with pre-existing vitreoretinal pathology. Hence, this emphasises the need for careful preoperative planning in patients with AH, including repeat measurements, comparison of optical vs ultrasound biometry and use of intraoperative aberrometry when available.

The complication rates observed are relatively low and manageable. These findings are consistent with current literature, which suggests that while AH may present unique challenges during cataract surgery, appropriate surgical techniques and postoperative care can lead to favourable outcomes [30].

Limitation(s)

Limitations include small number of cases, and study did not consider the lens thickness and central corneal thickness.

CONCLUSION(S)

This study highlighted the clinical profile and outcomes of cataract surgery in patients with AH, who were mostly older adults with few systemic co-morbidities aside from diabetes. Surgery significantly improved visual acuity, with sustained benefits and minimal, manageable complications. A significant negative correlation between axial length and postoperative refraction suggests a shift toward myopia in longer eyes. These findings affirm the safety and effectiveness of cataract surgery in this population and emphasise the role of axial length in predicting refractive outcomes.

Note: This study was presented in BOS SUMMIT 2024.

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PARTICULARS OF CONTRIBUTORS:
1. Junior Resident, Department of Ophthalmology, Sri Devaraj Urs Medical College, Kolar, Karnataka, India.
2. Professor, Department of Ophthalmology, Sri Devaraj Urs Medical College, Kolar, Karnataka, India.
3. Junior Resident, Department of Ophthalmology, Sri Devaraj Urs Medical College, Kolar, Karnataka, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. T Sangeetha,
Professor, Department of Ophthalmology, Sri Devaraj Urs Medical College,
Kolar-563101, Karnataka, India.
E-mail: sangeetha31jayakumar@gmail.com

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