Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 6, 2021, Pages. 19121 - 19134
Received 25 April 2021; Accepted 08 May 2021.

Evaluation of Posterior Segment Pathologies by B-Scan in Vitreous Hemorrhage

Dr. Sonia Jaideep[1], Dr. Chakar Tajwidi[2], Dr. Sanjay Kumar[3], Dr. M. Faisal[4], Dr. Tahir Ghaffar[5], Dr. Farah Huma[6]

[1]Consultant Radiologist, Jinnah Postgraduate Medical Centre, Karachi

[2]Assistant Professor, Makran Medical College

[3]MBBS, FCPS, Assistant Professor, Makran Medical College, Turbat, Pakistan.

[4]Designation head of department and assistant professor radiology department, Baqai Medical college

[5]Senior Registrar, Ophthalmology Department, Mayo Hospital

[6]King Edward Medical University ; Lahore, PGR; Ophthalmology, Eye Unit-1; Mayo Hospital Lahore

INTRODUCTION: Vitreous hemorrhage is the extravasation, or leakage, of blood into the areas in and around the vitreous humor of the eye.[1]The vitreous humor is the clear gel that fills the space between the lens and the retina of the eye. Ocular Bscan ultrasonography is a noninvasive method for diagnosis. It is used when the media is opacified enough to preclude a complete and clear (including view of the oraserrata) funduscopic examination.[2]B-scan provides cross sectional display of diseased tissues and is valuable in detecting unsuspected posterior segment diseases[3] .The frequency used in the diagnostic ophthalmic ultrasound for posterior segment is 8-10 MHz. B-scan instrumentation can be modified to an immersion technique used for the anterior segment study.B-Scan can image through severely swollen lids, corneal opacities, uveitis and persistent pupillary membrane. Over the last 30 years ultrasonography has greatly advanced and this has enabled us to study posterior segment of the eye in the presence of opaque media.[4-5]

OBJECTIVES: To determine the frequency of posterior segment pathologies in patients with vitreous hemorrhage

STUDY DESIGN: Descriptive Cross-Sectional

SETTING: Department of Ophthalmology, JPMC Karachi

DURATION: Six months after the approval of synopsis from 27 September 2019 to 27 March 2020

SUBJECTS AND METHODS: The total of 203patients, with vitreous hemorrhage was included in this study. B-scan ultrasound machine US Scan- 3300 (NIDEK) were used for the evaluation of vitreous opacities and underlying posterior segment pathologies. Topical anesthetic eye drop were used to achieve ocular surface anesthesia. All the clinical and ultrasound findings were recorded in pre designed proforma.

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 6, 2021, Pages. 19121 - 19134
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RESULTS: Two hundred and three (203) eyes of one hundred eighty eight (188) patients were assessed for posterior segment pathologies in this study and the results were analyzed as: Mean ± SD of age was 39.45±12.56 with C.I (37.64-41.25) years. Gender distribution showed 124 (66%) were male and 64 (34%) were female were female. Out of 203 eyes 71(36%) had retinal detachment, 30 (15%) had posterior detachment, 12 (6%) had intraocular foreign body and 90 (44%) eyes were normal.
CONCLUSION: The most common posterior segment pathology was retinal detachment followed by posterior detachment and intraocular foreign body. B-scan ultrasound is very useful diagnostic tool in detection and evaluation of vitreo-retinal pathologies in patients with opacities in the vitreous cavity.
KEY WORDS: Posterior Segment Pathologies, Vitreous Hemorrhage, B-scan Ultrasound

INTRODUCTION:

Cataract is defined as any congenital or acquired opacity in the lens capsule or substance, irrespective of the effect on vision[1] .It is the most common cause of reversible blindness in developing countries including Pakistan[2]. It is responsible for visual impairment in 17.7 million people and is the largest single cause of blindness[3]. It is estimated that globally approximately 15 million cataract operations are performed annually, an increase of 5 million from only 5 years ago[4]. In Pakistan the prevalence of mature cataracts in which the fundus details are not visible is about 30% through Mehra and Minassian classification system[3] and cataract is the most common procedure performed in opthalmology[5]. An estimated 570,000 individuals are bilaterally blind from cataract in Pakistan and there are estimated to be 356, 000, 0 eyes with visual acuity of less than 6/60 as a result of cataract[6]. The examiner is in dark about the possibility of posterior segment pathologies in mature cataract in which fundus is invisible to direct and indirect ophthalmoscopy. So ultrasonography is used as an additional diagnostic tool to evaluate the posterior segment pathologies. In an study, of 48 eyes with vitreous hemorrhage, tractional retinal detachment found in 29% cases, posterior vitreous detachment in 17% cases, rhegmatogenous retinal detachment in 12.5%, peripheral retinal tear 4%, intra ocular foreign body 4%, intra ocular tumor 4%.[6]

B-Scan USG examination is the safe, non-invasive, inexpensive, atraumatic and accurate means of evaluating the eye and may be repeated after a short time unlike in the case of other radiological techniques[8,9]. However, unlike computed tomography and magnetic resonance

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imaging (MRI), USG is examiner dependent. The B-scan USG accurately reproduces the anatomical structures of the eye. Its most common use is in a contact mode for evaluation of the posterior segment in eyes with media opacification. B-scan instrumentation can be modified to an immersion technique used for the anterior segment study. Its use has expanded to encompass biometric calculations, tissue characterization, and diagnosis of complex vitreo-retinal conditions and differentiation of intraocular masses[10]. The frequency used in the diagnostic ophthalmic ultrasound for posterior segment is 8-10 MHz. Over the last 30 years ultrasonography has greatly advanced and this has enabled us to study posterior segment of the eye in the presence of opaque media[11]. B-scan ultrasonography is simple, non-invasive and easily available and the results are reproducible[12]. B-Scan can image through severely swollen lids, corneal opacities, uveitis and persistent pupillary membrane. In such cases diagnostic B-scan ultrasound can accurately image the lens, vitreous, retina, choroid and sclera providing valuable clues as to their status. Most patients in developing countries have never had an ophthalmic examination till they present to the hospital with an advanced cataract for cataract surgery. Many posterior segment pathologies may coexist with cataracts. The incidence of posterior segment pathologies in eyes with age senile mature cataracts ranges from 7.90% to 19.6%[13,14]. In eyes with opaque media the incidence of vitreous hemorrhages is 4.8%, retinal detachment is 4.1% and posterior vitreous detachment are 4.3%[13,14] . B-scan ultrasonography is an important adjuvant for the clinical assessment of various ocular and orbital diseases. With understanding of the indications for ultrasonography and proper examination technique, one can gather a vast amount of information not possible with clinical examination alone.[13-14] B-scan provides cross sectional display of diseased tissues and is valuable in detecting unsuspected posterior segment diseases[3]. The frequency used in the diagnostic ophthalmic ultrasound for posterior segment is 8-10 MHz. Over the last 30 years ultrasonography has greatly advanced and this has enabled us to study posterior segment of the eye in the presence of opaque media.[14-15]

This study helps to diagnose the underlying pathology, to determine the timing of surgery, optimal placement of vitrectomy instruments and to predict the visual outcome and treat patients accordingly without delay. My study will also provide current and local statics of various posterior segment pathologies in addition my study will emphasize on early diagnosis and making strategies to overcome morbidity.

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LITERATURE REVIEW:

Mundt & Hughes published the first report on the use of diagnostic ultrasonography in the eye in 1956. Their paper discussed the use of industrial flow detecting equipment to examine in vitro enucleated eyes and patients with intraocular malignancies using the A-mode[14].

Baum & Greenwood pioneered the use of B-mode techniques for ocular examinations in the late 1950's. Their ultrasonic slit lamp incorporated a water emersion technology that was quickly adopted by a large number of workers. With the advent of B-scanning techniques in 1958, Baum & Greenwood pioneered a novel use of ultrasonography in the sectional analysis of the globe and orbit in real time. When evaluating the eye, both voluntary and voluntary movements can be evaluated[12].

In 1971, Ossoining K.C. reported that the acoustic features of orbital mass lesions are clearly defined and that ultrasound alone can provide information regarding the kind of an acoustically detectable mass. In 1977, Hodes B L et al. noted that the use of sonography has undoubtedly resulted in a decrease in the usage of invasive contrast radiology[13].

In 1987, Fielding JA adopted a simpler alternative method of performing ultrasound studies in ophthalmology by directly contacting the transducer on the closed eyelids via a coupling gel, in an attractive alternative to using a dedicated ultrasound scanner, and was found to be satisfactory after performing 200 scans in 184 patients[14].

Dunarintu S. et al. studied 151 patients between January 1998 and January 2007 to determine the role of radio imaging in diagnosing orbital tumours and establishing clinic-radiology and histopathological screening that is necessary to supplement more advanced imaging techniques such as CT and MRI. Ajnel H.M. et al. conducted a case study in 2001-2002 to determine whether sonography is useful in detecting eye or orbit diseases in 50 patients. They discovered orbital inflammation in ten (20%) cases, vascular tumours in ten (20%) cases, cystic tumours in three (6%) cases, and retinoblastoma in six (12%) cases. It was noted that USG can aid in the diagnosis of orbital lesions[15].

From March 2010 to May 2011, Alam M. et al. investigated the kind and severity of ocular injuries in blast survivors. In each patient, a B- SCAN was conducted specifically to rule out any

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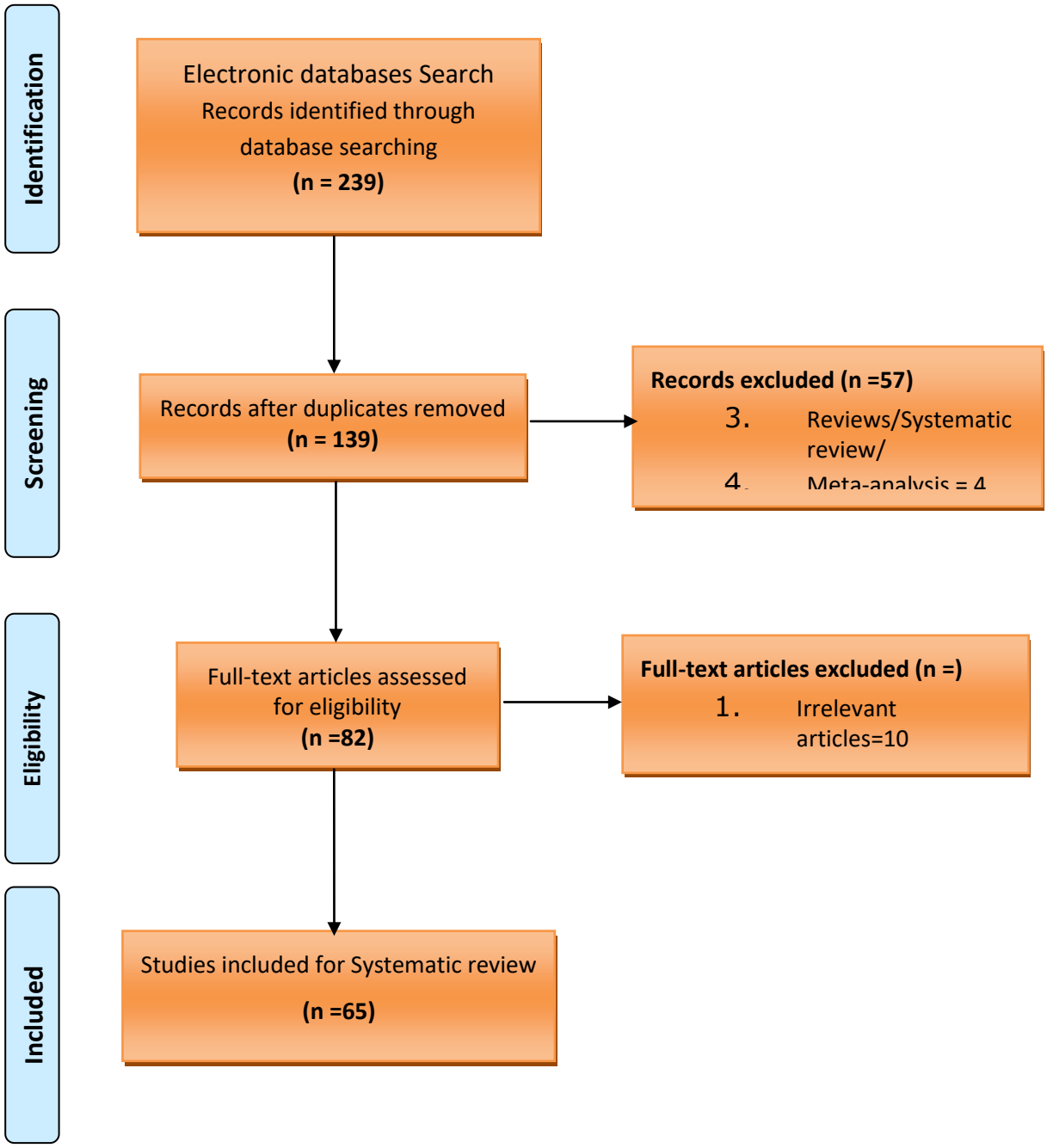
posterior segment disease. They noticed that 50 (63.29 percent) of patients had unilateral ocular injury, while 29 (36.70 percent) had bilateral ocular injury. 41 (37.96 percent) of patients had closed globe injury, while 67 (62.03 percent) had open globe injury. The most frequent kind of injury (48.14 percent) was corneal/scleral perforation, followed by vitreous haemorrhage (38.88 percent) and traumatic cataract (30.55 percent)[16]

PRISMA FLOW DIAGRAM:



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METHODOLOGY:

SAMPLE SIZE: By using WHO Sample size calculator, taking frequencies of intra ocular foreign body 4%6 person, margin of Error (d) 2.7% confidence interval 95%,theu the estimated sample n=203.

SAMPLING TECHNIQUE: Non-probability consecutive sampling Sample selection

INCLUSION CRITERIA	EXCLUSION CRITERIA
Age 18-60 years	Cataract (Opacification of lens fibers)
Either sex	Patients undergone recent surgeries
Case of vitreous hemorrhage	Patients on steroids, immunosuppression or chemotherapy
Provide consent	

DATA COLLECTION PROCEDURE: The study was conducted after approval from ethical review committee. Patients who fulfill inclusion criteria were included in the study after taking informed consent. B-scan ultrasound was performed for the evaluation of vitreous opacities and underlying posterior segment pathologies as mentioned in operational definition. Topical anaesthetic eye drop was used to achieve ocular surface anesthesia. The B-Scan machine used US Scan3300 (NIDEK) were used. Hydroxypropyl methyl cellulose was used as the coupling material. Patient was seated in comfortable reclining chair. B-scan was performed by expert ophthalmologist having at least five years of experience in B-scan ultrasonography. The clinical and ultrasound findings will be recorded in proforma.

DATA ANALYSIS: Data were entered and analyzed using SPSS version 20.0. Continuous variable like age was reported as mean and standard deviation. Categorical variable like sex, and outcome variable like posterior vitreous detachment, Retinal detachment, intra ocular foreign body were presented as frequencies and percentages. Effect modifiers like age, gender were controlled through stratification by applying Chi square test and P-vale ≤ 0.05 was considered significant.

RESULTS:

In this study 188 patients (203) eyes with vitreous hemorrhage were included in this study. Mean ± SD of age was 39.45±12.56 with C.I (37.64-41.25) years as shown:

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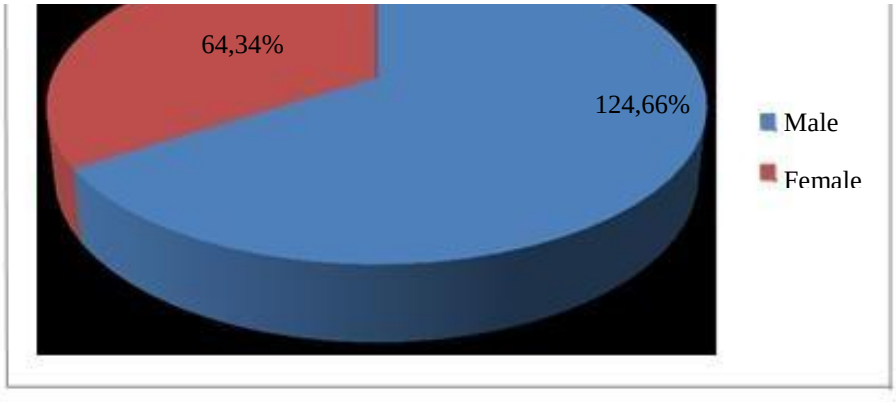
	MEAN	±SD	95% CONFIDENCE INTERVAL
AGE	39.45	12.56	37.64-41.25

Out of 188 patients 124 (66%) were male and 64(34%) were female as shown:

In Stratification of posterior segment pathologies with respect to gender 124 males (134) eyes and 64 females (69) eyes. Out of 134 male eyes 48 had retinal detachment similarly for females out 69 eyes 23 had retinal detachment and P value found to be non-significant i.e. (0.725). Similarly in case of Posterior vitreous detachment and Intra ocular foreign body P value were also found to be non-significant i.e. (0.452) and (0.615) respectively as shown:



Pathologies	Males	Females	P-value
Retinal Detachment			
Yes	**48**	**23**	**0.25**
No	**86**	**46**	
Posterior Vitreous Detachment			
Yes	**18**	**13**	**0.452**
No	**116**	**57**	
Intraocular Foreign Body			

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Yes	**8**	**4**	**0.615**
No	**126**	**65**	

In Stratification of posterior segment pathologies with respect to age group in case of retinal detachment and Posterior vitreous detachment were found to highly significant i.e. P (0.003) and P(0.004) for retinal detachment and Posterior vitreous detachment respectively. But in case of Intra ocular foreign body P value found to non-significant i.e. P (0.599) as shown:

Pathologies	18-35 years	36-60 years	P-value
Retinal Detachment			
Yes	**48**	**23**	**0.25**
No	**86**	**46**	
Posterior Vitreous Detachment			
Yes	**18**	**13**	**0.452**
No	**116**	**57**	
Intraocular Foreign Body			
Yes	**8**	**4**	**0.615**
No	**126**	**65**	

DISCUSSION:

Eye occupies a very obvious and prominent location in our body, which provides us a panoramic view of scenes, helping us in our daily chores, pleasurable activities and defense against odds and professional tasks. If any problem occurs to eyes due to aging, illness, drug abuse or trauma, all the charms of life is badly affected resulting in deterioration of quality of life. Age related cataract occupies a major place among these problems[17]. So a proper evaluation and management is necessary for the patients having cataracts.

If the patient has some posterior segment pathology then examination and knowledge of these pathologies will help the surgeon in explaining the prognosis of cataract surgery to the patient preoperatively[18]. The objective of this study was to evaluate the posterior segment with B scan

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ultrasonography to detect abnormalities like retinal detachment, vitreous hemorrhage and posterior vitreous detachment and to plan and manage accordingly.

A total of 203 eyes were included in this study. These 203 eyes were of 188 patients because 15 patients had bilateral mature cataracts. Most of the patients (73.39%) were in the range of 36-60 years of age. This is the age where senile cataracts are more common. This is more than the study mentioned in American Academy of Ophthalmology, which showed that the prevalence of cataracts is 50% in people between the ages of 40 and 657years[19]. Age related cataracts were more common in males (65.48%) than in females (34.51%). The reason for this increase number of males might be because males have better access to hospitals and economically independent whereas females are dependent on males for all their needs including health in our society[23].

In these 203 eyes 65 eyes (18.05%) were having a VA of counting fingers close to the eyes, 154/360 eyes (42.77%) were hand movement and 141/360 (39.1%) eyes were having a VA of perception of light. Out of these 84 eyes of 42 patients were having bilateral mature cataracts, which is a quite significant number. In these 42 patients 6 patients were having a VA of counting fingers close to the eyes, 21 patients were hand movement and 15 patients were having a VA of perception of light. These 42 patients were suffering from reversible blindness. So these patients must be given preference at the community level and facilities should be provided, so the patients got operated before this stage is reached. 9/203 patients (4.43%) were one eyed[24].

These patients were handicapped due to mature cataract. These patients should be operated earlier and special care must be given to these patients and to be operated by senior surgeon because that eye is the only hope of vision for them, so that their quality of life could be improved. Out of these 203 eyes with senile mature cataracts, 30 (14.72%) eyes were found to have some positive findings. 14.72% of the eyes had some ultrasonically detectable posterior segment pathologies. Theses 14.72% pathologies were close to the study done by Hanif M, Munir MS, Altaf S and Ali M that showed that 13.87% of the eyes were found to have significant posterior segment pathologies[21].

In another study done by Ali SI and Rehman H showed that 11% of the patients with non-traumatic mature cataracts were found to have posterior segment pathologies[101]. In the same study they also perform B-scan ultrasonography of 82 post-traumatic mature cataracts patients, which showed that 54/82 patients (65.85%) had some form of ultrasonically detectable posterior segment pathologies. The figures of traumatic mature cataracts with posterior segment pathologies were much higher than nontraumatic mature cataracts. In another study conducted by Anteby II, Blumenthol EZ, Zamir E and colleagues revealed that 19.6% patients with mature cataracts had posterior segment pathology[24].

This is significantly higher than my study, Hanif M, Munir MS and colleagues study and Ali SI, Rehman H study. But in another study conducted by Salman A, Parmer P and colleagues demonstrated 8.6% ultrasonically detectable posterior segment pathologies in eyes with

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advanced cataracts, which is lower than the above mentioned studies[20]. In my study the incidence of posterior segment pathologies increases with age. 84.07% of the posterior segment pathologies lie between 36 to 60 years of age in patients with mature cataracts and progressively increases with advancement of age. Only 15.93% of patients with posterior segment pathologies were found between the ages of 18-35 years. The percentage of posterior segment pathologies in male patients was 65.48% where that of female eyes was 34.51%. It showed no significant difference for posterior segment pathologies between the genders.

These posterior segment pathologies in my study were retinal detachment, posterior vitreous detachments and intra ocular foreign body.Other pathologies of posterior segment which were not included in my study but found on B-scan ultrasonography were asteroid hyalosis, scleral thickening and posterior staphyloma. A total of 71 eyes (34.97%) had retinal detachments. Out of these 48 patients were male and 23 were females. This figure (34.97%) of retinal detachment in senile mature cataracts in my study is almost equal to the study of Ahmed I, Shaikh FF, and colleagues (36.8%) [25].

CONCLUSION:

The most common posterior segment pathology was retinal detachment followed by posterior detachment and intraocular foreign body. B-scan ultrasound is very useful diagnostic tool in detection and evaluation of vitreo-retinal pathologies in patients with opacities in the vitreous cavity. It is also recommended that a follow up study after cataract extraction should be done to assess the status of vitreous and retina and compare it with preoperative finding of B-scan ultrasonography.

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