



**POSTERIOR SEGMENT EYE DISEASES DETECTED BY  
B-SCAN ULTRASONOGRAPHY IN ADVANCED CATARACT**  
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**Abstract:**

**Background:** Ultrasonography is useful in detecting significant abnormalities in eyes with opaque media like advanced cataracts. This can help in better surgical planning and predicting appropriate prognosis.

**Objective:** To detect posterior segment eye diseases (PSEDs) in advanced cataracts by B-scan ultrasonography.

**Materials and Methods:** One hundred and fifty patients attending in the event of non-visualization of fundus irrespective of age and gender were included in the study. All cases suspected to have orbital lesions, high risk extrusion of intraocular contents and previous history of ocular surgery were excluded from this study. Ultrasonography was done with the contact method.

**Results:** The current study revealed that 17.3% of the patients had PSEDs. These included 6% cases of retinal detachment, 5.3% vitreous haemorrhage, 2.6% optic nerve head cupping, 2% posterior staphyloma and 1.3% posterior vitreous detachment.

**Conclusion:** B-Scan ultrasonography is useful for the detection of hidden PSEDs in advanced cataract, which can help in better surgical planning and providing appropriate prognosis to the patients.

**Keywords:** Advanced cataract, diabetic retinopathy, posterior segment, retinal detachment, vitreous haemorrhage and ultrasonography.

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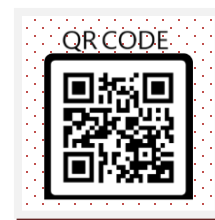
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**INTRODUCTION:**

Over past thirty years, the advances in the field of ultrasonography (USG) has made it possible for us to study the posterior segment of the eye even in the presence of opaque media.<sup>1</sup> The superficial position of the eye ball and its fluid content (aqueous humor, vitreous body) make it more suitable for examination with USG. When the light-transmitting media of the eye become opaque as in case of a cataract or a vitreous haemorrhage, USG is the only practical method to obtain the images of the posterior segment of the eye. It is the most useful investigation prior to vitrectomy procedure.<sup>2</sup> Ultrasonography is a non-invasive tool for evaluating the posterior segment in eyes with opaque media like advanced cataracts. Detection of significant posterior segment eye diseases (PSEDs) by ultrasound scan prior to cataract surgery helps the surgeon to provide an appropriate prognosis to the patient.

The incidence rates of PSEDs has been reported to vary from 19.6% to 66% in the studies conducted for USG evaluation of the eyes with opaque media.<sup>3,4</sup> Majority of patients with advanced cataract are currently encountered in developing countries, but most hospitals in these areas do not have an easy access to ultrasound. In absence of USG evaluation of the eye it becomes difficult for the operating surgeon to decide whether to go ahead with the cataract surgery or to refer the patient to the centres where ultrasound facility is available.<sup>5</sup>

Data about PSEDs in patients having cataract have remained a topic without extensive published literature. It is very important to ascertain the number of patients with PSEDs and to decide which patients need further intervention after cataract extraction. It is also critically important to examine the posterior segment of the eye prior to commencement of the cataract surgery. This not only helps to predict the visual outcome after cataract surgery, but also aids to diagnose and manage conditions such as diabetic retinopathy (DR) and retinal detachment (RD) etc. While as B-scan USG can help to diagnose gross pathologies such as RD, haemorrhage in the vitreous and posterior staphyloma, the finer pathologies are however difficult to assess. Fundus examination of the fellow eye may provide contributions in some cases of bilateral lesions only.<sup>6</sup> B-scan provides cross sectional display of diseased tissues and is beneficial in detecting unsuspected PSEDs.<sup>1</sup> The frequency used in the diagnostic ophthalmic ultrasound for the posterior segment of the eye is 8-10 Mhz. It is most commonly used in a contact mode for examining the posterior

segment in eyes with media opacities and evaluating structural changes in the posterior segment of the eye in such patients.<sup>7,8</sup> Ultrasonography is essential in the investigation and management of many ocular and orbital disorders. The evaluation of eyes with opaque ocular media is one of the primary indications for the use of ocular ultrasonography. Therefore, preoperative USG of the globe has been recommended prior to cataract extraction when the fundus cannot be visualized.<sup>9</sup> Without proper examination of the posterior segment, the results of cataract surgery should not be unduly overrated as the visual outcome may vary with lesions in the posterior segment.<sup>10</sup> The aim of this study was to assess undiagnosed PSEDs with the diagnostic tool of B-scan ultrasonography in eyes with advanced cataract.

**MATERIALS AND METHODS:*****Ethical issues***

Certificate of ethical approval was obtained from the Deanship of Scientific Research, Northern Border University and ethical principles were considered in all steps of this research project.

***Study design***

This study was a descriptive cross-sectional study with non-probability convenience sampling. Over a period of 1 year, from May 2017, patients were selected from out-patient department (OPD) of ophthalmology at Central Hospital, Arar, Kingdom of Saudi Arabia.

***Methods***

All patients in the event of non-visualization of fundus irrespective of age and gender were included and cases suspected to have orbital lesions, high risk extrusion of intraocular contents and previous history of ocular surgery were excluded from the current study. After obtaining free informed consent, every participant was subjected to detailed history taking, followed by visual acuity testing for distance and near on Snellens chart, external ocular examination, slit lamp examination, tonometry, ophthalmoscopy and B-scan ultrasonography. All patients were evaluated using standard USG machines (GE Logic E9 and Toshiba Aplio XG) equipped with a real-time high-frequency probe. Ultrasonography was done with the contact method. Ultrasonic probe was placed over the globe with closed lid after application of the coupling gel and then transverse, antero-posterior and longitudinal scans were taken. High gain [80-90 db] and low gain [60-70 db] sensitivity were selected during the ultrasonography.

***Data Analysis***

Data were entered and analysed using Prism5 (Graph Pad Software Inc., San Diego, CA). Descriptive analysis was performed by calculating frequency and

percentages for qualitative variables, whereas mean  $\pm$  standard deviation were calculated for participants' ages.

**RESULTS:**

A total of 150 patients were examined in this study. Their mean age was found to be 62.0 $\pm$ 12.02 years whereas 48% of them were  $\geq$  61 years of age. Sixty

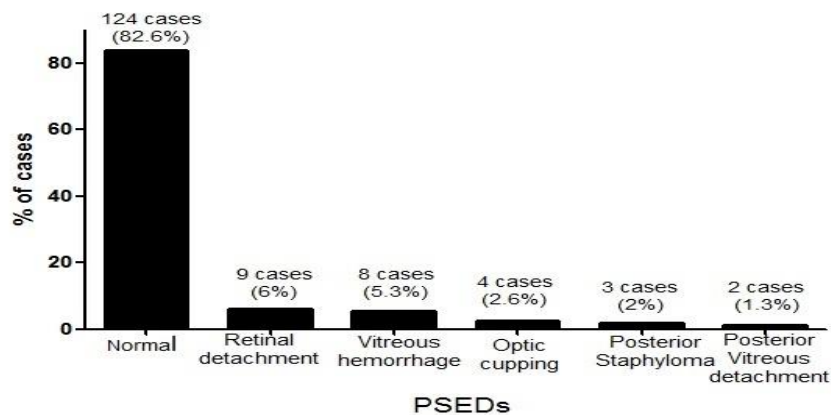
per cent of the participants were males and 86% were Saudi nationals. Sixty-eight per cent of them had unilateral presenting eye complaint whereas 23% of them had either diabetes mellitus alone or had it along with hypertension. Their mean intraocular pressure (IOP) was found to be 20 $\pm$ mmHg (Table 1).

**Table 1:** Basic variables of the patients

Variables (n=100)		Mean $\pm$ SD / Frequency
Age (years)		62.0 $\pm$ 12.02
Age groups (years)	$\leq$ 40	3(2%)
	41-50	33(22%)
	51-60	42 (28%)
	$\geq$ 61	72 (48%)
Gender	Male	90 (60%)
	Female	60 (40%)
Nationality	Saudi	129 (86%)
	Egyptian	9 (6%)
	Syrian	7 (5%)
	Indian	5 (3%)
Presenting complaint	Bilateral	48 (32%)
	Left eye	75 (50%)
	Right eye	27 (18%)
Past Medical and Surgical History	None	114 (76%)
	Phacoemulsification in fellow eye	2 (1%)
	Diabetes Mellitus	18 (8%)
	Diabetes Mellitus with Hypertension	23 (15%)
Intraocular Pressure (mm. Hg)		20 $\pm$ 7.6

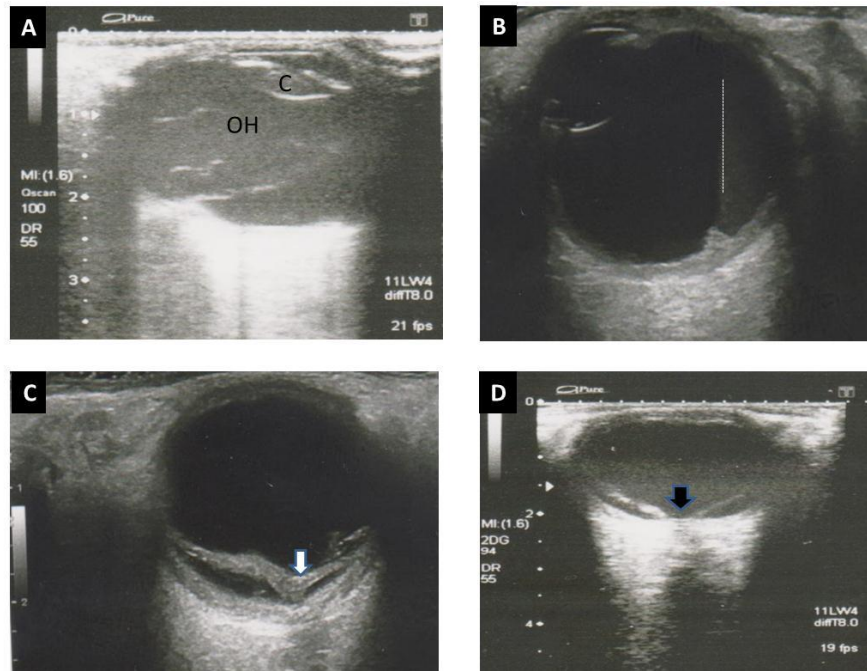
Slit lamp examination showed some eye pathology in the anterior segment of the eye in total 9% of patients in which anterior uveitis with posterior synechiae was found in 6% of patients and corneal opacity in 3% of patients.

On B-Scan ultrasonography 17.3% of the patients were found to have some ocular pathology in the posterior segment of the eye, which are shown in Figure 1.



**Figure 1:** Posterior segment eye diseases (PSEDs) detected on B-Scan ultrasonography

The commonest PSED was retinal detachment followed by vitreous haemorrhage. Some examples of PSEDs found in this study are described in images and shown in Figure 2.



**Figure 2:** Some examples of the posterior segment eye diseases found in our study

- A;** B-scan shows a cataract (C) associated with organized vitreous haemorrhage (OH).
- B;** B- Scan shows subvitreal haemorrhage forming a fluid level (dotted line) behind the vitreous collapsing gel.
- C;** B-scan in another patient, shows classic funnel-shape total RD (White arrow).
- D;** B-scan shows retinal detachment. The retina shows firm attachment at the ora serrata anteriorly and the optic nerve head posteriorly (Black arrow).

**DISCUSSION:**

Ultrasonography (USG) is an advanced technique that enables us to study posterior segment of the eye in presence of opaque media like advanced cataract, which is one of the leading causes of treatable blindness in developing countries. In the current study 150 cases with advanced cataract were examined by B-scan USG. Posterior segment eye diseases (PSEDs) were found 17.3% of the patients. Retinal detachment was detected in 6%, while vitreous haemorrhage was diagnosed in 5.3% of the participants. Optic nerve head cupping, posterior staphyloma and posterior vitreous detachment were observed in 2.6%, 2 % and 1.3% of cases respectively.

In the current study, most of the patients were found to be of  $\geq 61$  years of age because cataract is prone to develop in older ages. In our study 60% of the patients were males as they are more interested to cataract surgical services. The same was reported by Lewallen S and Courtright P (2002).<sup>11</sup> Also more male cases were reported in an ophthalmic research carried out in a developing country by Chanchlani M et al. (2016).<sup>12</sup>

B-Scan USG revealed that 17.3% of the patients in this study were found to have some posterior segment eye diseases (PSEDs). This is in accordance with previous results reported by Hanif M et al. (2007)<sup>13</sup> and Meenakshi et al. (2015)<sup>14</sup>, who have reported 13.8% and 11% respectively as percentages of PSEDs detected by B-mode USG. Much lower percentage of PSEDs was reported by Salman A et al. (2006)<sup>5</sup> and Chanchlani M et al. (2016)<sup>12</sup>, who reported only 9% and 8.7% patients respectively who had shown PSEDs. On the other hand PSEDs was found in 77.5% in cases screened by B-mode ultrasonography in cataract campaigns between the years of 2005 and 2007 by Mendes et al.<sup>15</sup> These statistical inconsistencies regarding the prevalence of PSEDs by USG may be due to differences among the population examined and exclusion and inclusion criteria in each study. In addition, method of examination and the skills of examiners are also supposed to have a role.

In the present study, retinal detachment (RD) was reported to be the commonest PSED detected by B-Scan USG. Similarly, RD was reported also to be the

commonest PSED detected by B-scan by Qureshi MA and Laghari K (2010)<sup>16</sup>, Meenakshi V et al. (2015)<sup>14</sup> and Jain A et al. (2017)<sup>17</sup>, who have reported RD prevalence to be 3%, 2.5% and 5% respectively. RD was also reported to be found in up to 9.3% of cases examined by B-Scan by Mendes MH et al. (2009).<sup>15</sup>

Vitreous haemorrhage (VH) was the second commonest PSED in the current study. It was found in 5.3% of the studied participants. Vitreous haemorrhage was reported in posterior segment B-Scan USG studies to range from 1-3%<sup>9, 18</sup>, which is lower than the percentage found in the present study. This difference is expected to be mainly due to higher percentage of diabetics and hypertensive patients (23% of participants) in this study with expected higher incidence of proliferative retinopathy with higher incidence of VH.

Current data showed that optic cupping was present in 2.6% of cases. Optic disc diameters and optic disc cupping were also studied by USG in previous studies.<sup>5, 19</sup> We have only studied the presence or absence of abnormal optic disc cupping and the differences in these studies may be dependent on the population studied and also on the presence of certain diseases like glaucoma.

In accordance with our study, posterior staphyloma was the least found lesion (in 2% participants) detected on USG by Qureshi MA and Laghari K (2010).<sup>16</sup> However, other studies by Anteby II et al (1998)<sup>3</sup> and Shaikh FU et al (2009)<sup>9</sup> had reported posterior staphyloma to be the commonest finding by B-Scan USG with percentages of 7.2% and 3.5% respectively. This diversion of data is expected with better awareness, diagnosis and treatment modalities correcting refractive errors and better planned ophthalmic health care service from 1998 to 2017 and less incidence of posterior staphyloma as a complication of high myopia.

These findings are important as they demonstrate that preoperative ultrasonographic evaluation is highly recommended in patients with advanced cataracts or other opacities. Moreover, the ultrasound also provides useful information for better planning of cataract surgery and predicting visual prognosis. However, considering these results and to what extent these findings are consistent with the clinical features and other diagnostic modalities will be enlightening for the assessment of the complications.

#### CONCLUSION:

B-Scan ultrasonography is a useful method of investigation for detecting hidden posterior segment diseases and can be performed on patients with

advanced cataract. Availability of ultrasound machines in the settings where cataract surgeries are performed would help in better surgical planning and management of patients with advanced cataracts.

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