

## DIAGNOSTIC AND THERAPEUTIC ROLE OF B SCAN ULTRASONOGRAPHY IN TRAUMATIZED EYES

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**ABSTRACT: AIM:** To study the role of B scan ultrasonography as a diagnostic and therapeutic tool in the management of traumatized eyes. **MATERIAL AND METHODS:** In a prospective study done in the Regional Institute of Ophthalmology, Amritsar during 2011--2013, B scan ultrasonography was done on 50 traumatized eyes. **RESULTS:** In the present study, maximum incidence of ocular trauma (36%) was in the age group of 15-29 years; more so in males (70%) with the incidence of close globe injuries being 60%. Patients mostly reported within 1 week of injury (70%). Intraocular lesions diagnosed on B-scan imaging were cataract 25(50%), dislocated lens 2(4%), vitreous hemorrhage 20(40%), posterior vitreous detachment 5(10%), retinal detachment 13(26%) and foreign body in 2(4%) cases. More than one finding was observed in 27 cases. In 25 cases with cataract, vitreous hemorrhage was seen in 5(20%), posterior vitreous detachment in 4(16%) and retinal detachment in 4(16%). Of the 20 cases of vitreous hemorrhage 3(15%) had retinal detachment. B-Scan imaging proved beneficial in the management of the traumatized eyes. 12(24%) cases of traumatic cataract with no abnormality in the posterior segment underwent successful cataract extraction with IOL implantation. 27(54%) cases were referred to the vitreo-retinal surgeon while 11(22%) were followed up on appropriate medical treatment.

**KEYWORDS:** Regional institute of ophthalmology, Ultrasonography, Ocular trauma

**INTRODUCTION:** Ultrasound is an acoustic wave that consists of an oscillation of particles within a medium. Diagnostic ophthalmic ultrasonography (Amplitude modulated scanning) was first reported in 1956 by Mundt and Hughes.<sup>1</sup> B scan was introduced in ophthalmic practice by Baum and Greenwood in 1958.<sup>2</sup> For more than three decades, B-scan ultrasonography has played a key role as a valuable diagnostic imaging device in the field of Ophthalmology. The more invasive fluid-immersion technique of B -scan has now evolved to be less intrusive, utilizing the contact method which is most commonly used for the evaluation of the posterior segment of the eye in opaque media.

**MATERIAL AND METHODS:** A prospective diagnostic study was done to localize the various posterior segment lesions in patients of ocular trauma with opaque media from 2011 to 2013. All patients underwent detailed clinical examination which included recording of visual acuity, intraocular pressure measurement where possible, slit lamp biomicroscopy, indirect ophthalmoscopy and plain radiography of orbit when necessary. Patients with history of previous ocular surgery, known anterior or posterior segment pathology were excluded from the study. B scan ultrasonography over closed eye lids using a focused transducer was done with Paradigm P 60 gray scale real time ultrasound machine in sitting posture. A photograph using a polaroid camera was taken. Results were correlated with clinical findings and therapeutic management was planned accordingly.

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**OBSERVATIONS AND RESULTS:** Maximum incidence of ocular trauma (36%) was in the age group of 15-29 years. The majority of the cases were male (70%).

Age group (in years)	No. of cases	Incidence (%)
0-14	03	6%
15-29	18	36%
30-44	13	26%
45-59	09	18%
60 and >60	07	14%
<b>Total</b>	<b>50</b>	<b>100%</b>

**TABLE I: SHOWING AGE DISTRIBUTION**

The incidence of ocular trauma in males was 70% and that in females was 30%

SEX	NUMBER OF CASES	INCIDENCE
Male	35	70%
Female	15	30%
<b>Total</b>	<b>50</b>	<b>100%</b>

**TABLE II: SHOWING SEX WISE DISTRIBUTION**

The involvement of right eye was observed in 35(70%) cases and that of left eye in 15(30%) cases.

LATERALITY	NO. OF CASES	INCIDENCE (%)
Right eye	35	70
Left eye	15	30

**TABLE III: SHOWING THE LATERALITY OF OCULAR TRAUMA**

The incidence of close globe injuries was 60% as compared to open globe injuries which was 40% of cases.

TYPE OF INJURY	NO. OF CASES	PERCENTAGE
CLOSED GLOBE	30	60%
OPEN GLOBE	20	40%
<b>Total</b>	<b>50</b>	<b>100%</b>

**TABLE IV: SHOWING TYPE OF INJURY**

TIME ELAPSED SINCE INJURY	TYPE OF INJURY	NO. OF CASES	TOTAL Cases (%)
Within 1 week	Open globe	17(34%)	35(70%)
	Closed globe	18(36%)	
After 1 week	Open globe	3(6%)	15(30)%
	Closed globe	12(24%)	
<b>Total</b>		<b>50</b>	<b>100%</b>

**TABLE V: SHOWING TIME ELAPSED SINCE INJURY**

Most commonly the patient presented within 1 week of injury.

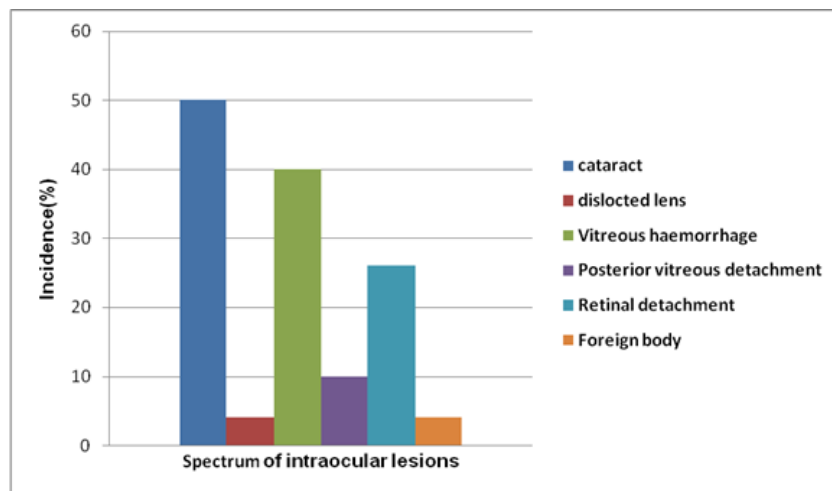
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INDICATIONS FOR ULTRASONIC EYE EXAMINATION:	NO. OF CASES	PERCENTAGE
Corneal opacity/edema	10	20%
Hyphaema	05	10%
Cataract	25	50%
Vitreous hemorrhage	20	40%

**TABLE VI: SHOWING INDICATIONS FOR ULTRASONIC EYE EXAMINATION**

Out of 50 cases with opaque media 10(20%) cases had corneal opacity/edema, 5(10%) cases had hyphaema, 25(50%) cases had cataract, and 20(40%) cases had vitreous hemorrhage. More than one cause of opaque media was there in 10(20%) cases.

The various intraocular lesions diagnosed on B Scan imaging were cataract in 25(50%) cases, dislocated lens in 2(4%) cases, vitreous hemorrhage in 20(40%) cases, posterior vitreous detachment in 5(10%) cases, retinal detachment in 13(26%) cases, foreign body in 2(4%) cases. More than one finding was observed in 27 cases.



**Fig. 1: DEPICTING THE SPECTRUM OF INTRAOCULAR LESIONS**

ULTRASOUND FINDINGS	NO. OF CASES	PERCENTAGE
Vitreous hemorrhage with retinal detachment	03	15 %
Vitreous hemorrhage without retinal detachment	17	85 %
<b>Total</b>	<b>20</b>	<b>100%</b>

**TABLE VII: SHOWING ULTRASONIC EVALUATION OF PATIENTS WITH VITREOUS HAEMORRHAGE**

Of the 20 cases of vitreous hemorrhage 3(15%) cases presented with retinal detachment and 17(85%) cases presented without retinal detachment.

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<b>Ultrasonic evaluation of patients with retinal detachment</b>	<b>No. of cases</b>	<b>Percentage</b>
Complete retinal detachment	3	23.07%
Partial retinal detachment	10	76.92%
<b>Total</b>	<b>13</b>	<b>100%</b>

**TABLE. VIII: SHOWING ULTRASONIC EVALUATION OF PATIENTS WITH RETINAL DETACHMENT**

Of the 13 cases of retinal detachment 3(23.07%) cases were complete and 10(76.9%) cases were partial.

<b>ULTRASONIC EVALUATION OF PATIENTS WITH CATARACT</b>	<b>No. OF CASES</b>	<b>PERCENTAGE</b>
Vitreous hemorrhage	5	20%
Posterior vitreous detachment	4	16%
Retinal detachment	4	16%
No abnormality detected in the posterior segment	12	48%
<b>Total</b>	<b>25</b>	<b>100%</b>

**TABLE IX: SHOWING ULTRASONIC EVALUATION OF PATIENTS WITH CATARACT**

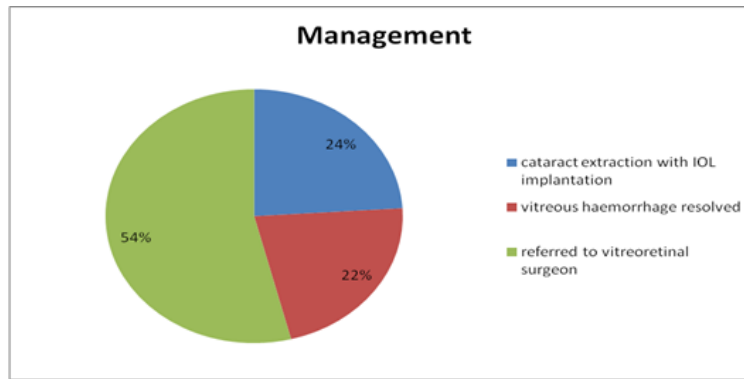
Out of the 25 cases of cataract, vitreous hemorrhage was seen in 5(20%) cases, posterior vitreous detachment was seen in 4(16%) cases and retinal detachment was seen in 4(16%) cases and no abnormality was detected in posterior segment in 12(48%) cases.

<b>ASSOCIATED ULTRASOUND FINDINGS</b>	<b>NO. OF CASES</b>	<b>PERCENTAGE</b>
Vitreous hemorrhage	1	50%
Retinal detachment	1	50%
<b>Total</b>	<b>2</b>	<b>100%</b>

**TABLE X: SHOWING ULTRASONIC EVALUATION OF PATIENTS WITH FOREIGN BODY**

Out of the 2 cases of foreign body revealed on ultrasonic evaluation of patients with ocular trauma, associated vitreous hemorrhage was found in 1(50%) case and retinal detachment was found in 1(50%) case.

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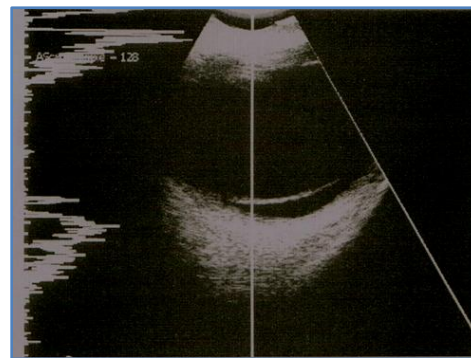


**Fig. 2: showing management of various lesions in traumatized eye**

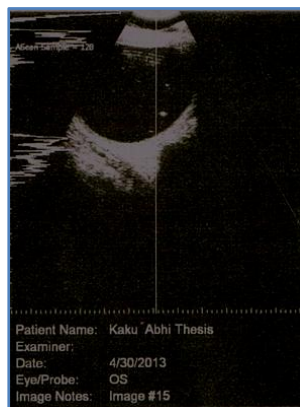
12(24%) cases of ocular trauma with cataract in which no abnormality in the posterior segment was detected on B Scan underwent cataract extraction with IOL implantation. 11(22%) cases in which only vitreous hemorrhage was present, resolved spontaneously. Rest of the 27(54%) cases were referred to vitreo-retinal surgeon.



**SCAN 1: SHOWING COMPLETE RETINAL DETACHMENT**

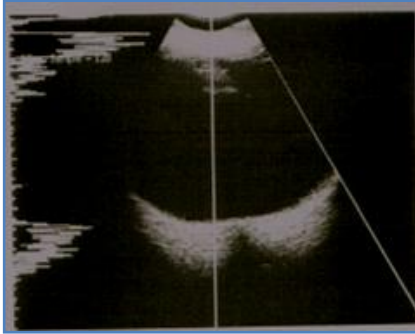


**SCAN 2: SHOWING PARTIAL RETINAL DETACHMENT**

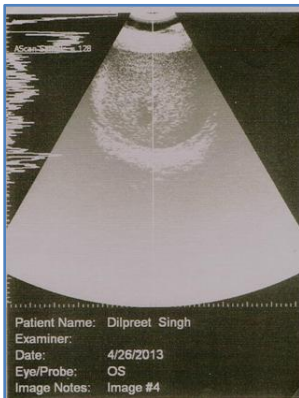


**SCAN 3: SHOWING FOREIGN BODY IN THE POSTERIOR SEGMENT**

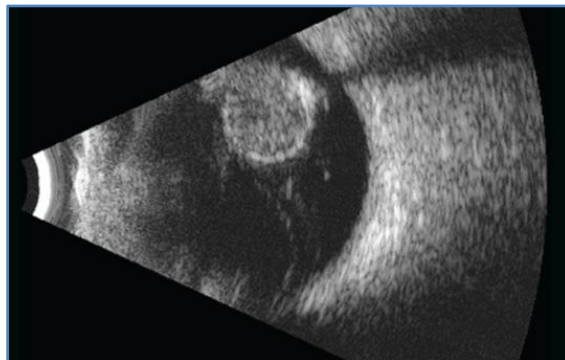
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**SCAN 4: SHOWING TRAUMATIC CATARACT WITHOUT ANY ASSOCIATED ABNORMALITY IN THE POSTERIOR SEGMENT**



**SCAN 5: SHOWING VITREOUS HEMORRHAGE**



**SCAN 6: SHOWING LENS DISLOCATED INTO THE VITREOUS HUMOR**

**DISCUSSION:** Ocular trauma is one of the leading cause of blindness in our environment.<sup>3</sup> The clinical use of ophthalmic ultrasound has increased dramatically over the past twenty years and has presently reached the point where it is universally regarded as an essential means of soft tissue examination of the eye and orbit.<sup>4</sup> The sonography examination is rapid and cost-efficient, without the contraindications, such as pacemakers, that MRI has. Sonography avoids the irradiation associated with CT and the need for sedation in children.<sup>5</sup> Presence of abnormal echoes in vitreous cavity is seen in vitreous hemorrhage.

Ultrasonography permits accurate localization of foreign body. In case of dislocated lens, B-scan USG could graphically demonstrate the posterior of lens & associated abnormalities. Dislocation of lens into opaque media is a perfect indication for ultrasound. The abnormally placed lens is easily detected because of its shape and strong reflectivity. Ilisar et al in 1977 reported that out of 205 cases the highest incidence (32%) of ocular injuries was found in the age group of 21-30 years.<sup>6</sup> Gothwal et al in 1999 reported that in their study of ocular injuries, children (<16 years) constituted 46.8% of the total affected population.<sup>7</sup> Gupta et al in 1990 reported the incidence of ocular trauma in males to be 84% and in females to be 16%.<sup>8</sup> Wilson et al in 1991 found the incidence of ocular trauma in males to be 78% and in females to be 22%.<sup>9</sup> Serrano et al in 2003 reported the incidence in males to be 64.9% and in females to be 35.1%.<sup>10</sup>

Smith et al in 2006 reported the incidence of closed globe and open globe to be 68.5% and 31.4% respectively.<sup>11</sup> The closed globe injuries are more common than open globe injuries probably because the agents causing these types of injuries are more common in nature while those causing open globe injuries are generally sharp and pointed objects only. Babar et al in 2007 reported that 40

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% of patients presented within 1 week of injury and 60% presented after one week.<sup>12</sup> In their retrospective study of 96 patients of ocular trauma Gyasi et al in 2004 reported that one third of the cases reported in less than 24 hrs. after injury. 57.3% reported between 24 and 48 hrs. and 21% reported after 1 week of injury.<sup>13</sup>

Gadkari et al conducted a study using a simultaneous A and B scan in 100 patients. According to them information about state of posterior segment can be sought in presence of opaque media and this helps in planning of surgery. A scan vector guided by B scan displays an important role in differentiating retinal detachment from vitreous membranes, band and posterior vitreous detachment.<sup>14</sup>

Zakov reported that in 50 eyes with opaque media, retinal detachment was diagnosed with 90% accuracy by a prospective study.<sup>15</sup> Munk et al in 1991 demonstrated lens fragmentation with individual fragments distinctly discernible on ultrasound.<sup>16</sup> Conventional ultrasonography is more useful for localizing foreign bodies in relation to the sclera. It is also superior in demonstrating ocular damage associated with intraocular foreign bodies.<sup>17</sup>

Haile utilized B-scan ultrasonography on 318 eyes of 298 patients for evaluation of 285 eyes with opaque media, 3 eyes with clear media but with suspected intra ocular abnormalities and for proptosis in 30 cases. 209(66%) eyes had one or more detectable abnormality. Most common abnormality was retinal detachment (39%), followed by vitreous opacities (31%), eye ball size abnormalities (12%), intraocular foreign body (4%), posterior staphyloma (3%) and retinal detachment with vitreous opacities (2%).<sup>18</sup>

The above studies correlate well with the findings in our study. However Saxena in 2002 reported the incidence of closed globe and open globe to be 42.2% and 53.9% respectively.<sup>19</sup>

**CONCLUSION:** B Scan proved to be a valuable tool in diagnosing the posterior segment lesions in traumatized eyes with opaque media. The results were encouraging and made a significant difference in the management outcome. Patients with cataract without any posterior segment findings were operated with intraocular lens implantation and the rest were referred to the vitreo-retinal surgeon for management.

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