Preoperative Posterior Segment Evaluation by Ultrasonography in Dense Cataract

Faheem Ullah Shaikh, Ashok Kumar Narsani, Shafi Muhammad Jatoi, Ziauddin A. Shaikh

Purpose: Ultrasonography is an important tool for evaluating the posterior segment in eyes with opaque media.

Material and Method: The study was conducted in the Department of Ophthalmology, Civil Hospital Karachi from October 2005 to March 2006. In this study evaluation of two hundred and twenty seven eyes of 200 patients with dense cataract precluding visualization of fundus underwent examination by standardized B scan ultrasonography. Presence of certain ocular risk factors believed to be associated with a high incidence of abnormal posterior segment on ultrasound was looked for.

Result: Two hundred and twenty seven eyes of two hundred patients were included in the study. Twenty-seven patients had bilateral cataract and 6 patients were only eyed.

Age range was 43 to 81 years with a mean age of 51 years. One hundred and sixteen (58%) patients were male and 84 (42%) females. On B-Scan ultrasonography 18 (7.90%) eyes had finding suggestive of posterior segment pathology. The most common finding was posterior staphyloma in 8 (3.52%) eyes.

Out of the 200 patients 163 (81.5%) had no risk factor for abnormal posterior segment on ultrasonography, while 37 (18.5%) were associated with systemic and ocular risk factors, among them diabetes, hypertension and early age, posterior synechiae, elevated intraocular pressure and keratic precipitates were frequently seen.

Conclusion: Preoperative posterior segment evaluation with ultrasound in patients with dense cataract can be used to detect pathologies that may influence the surgical strategy and the postoperative visual prognosis.

It is only 50 years since ultrasound was first introduced to medical diagnosis; an astonishingly short period bearing in mind the impact this technique has exerted on all aspect of medical practices, including ophthalmology.

Baum and Greenwood\(^1\) jointly reported the first application of “brightness modulated” B-Scan in ophthalmology. They employed an immersion method. In 1972 Bronson and Turner described the first contact B-Scan\(^2\) making ultrasound an easy and patient friendly imaging modality. This, and other significant work by Purnell\(^3\) and Coleman et al\(^4\) laid to major expansion and popularization of B-Scan. The more recent development of duplex scanners and colored Doppler instruments in the 1980’s has facilitate their use in ophthalmology. Sergott, Leib, Williamson, Baxter and Guthoff were responsible for their wider application of Doppler to Ophthalmology\(^5\)\(^\text{-}^7\).

Its use has expanded to encompass biometric calculations, tissue characterization, diagnosis of complex vitro-retinal conditions and differentiation of intraocular masses\(^8\)\(^\text{-}^11\). In the orbit, ultrasound including Doppler, is used for the investigation of extraocular muscles\(^12\)\(^\text{-}^13\) and retrobulbar optic nerve...
disease\textsuperscript{14,15} vascular anomalies\textsuperscript{16} and orbital mass lesions\textsuperscript{17,18}.

In 1990 Pavlin and colleagues described the first high frequency ultrasound (50-100MHz) in Ophthalmology\textsuperscript{19}. UBM has allowed us to investigate subtypes of glaucoma, lesions in the iris, ciliary body, sclera, and pars plana\textsuperscript{20}.

Now ultrasound is considered an essential tool in the investigation and management of many ocular and orbital disorders\textsuperscript{21,22}. The evaluation of eyes with opaque ocular media is one of the primary indication for the use of ocular ultrasonography\textsuperscript{23,24}. Therefore preoperative ultrasonography of the globe has been recommended prior to cataract extraction when the fundus cannot be visualized\textsuperscript{9}.

**MATERIAL AND METHOD**

This prospective, nonrandomized interventional clinical trial was conducted at department of Ophthalmology Civil Hospital Karachi over a period 6 months from October 2005 to March 2006. All eyes with dense cataract that preclude a direct visualization of the fundus were evaluated by B-Scan ultrasonography. Patient younger than 40 years of age, those with known presence of posterior segment pathology in eyes to be operated, afferent pupillary conduction defect, presence of old or recent penetrating or blunt ocular injury or previous ocular surgery were excluded from study.

All registered patients were underwent preoperative examination protocol that includes determination of visual acuity, intraocular pressure, pupillary reaction, slit-lamp examination and biometry. Certain risk factors such as diabetes mellitus, hypertension, posterior synechiae, corneal opacity, deviated eyes, keratic precipitate, iris coloboma were specifically looked for and noted.

After completing ocular examination patients were evaluated by using the Nidek ultra scan imaging system by one surgeon. A combination of axial, longitudinal, and transverse B-Scan was used to study the eye. Significant posterior segment pathology on ultrasonography was defined as that affects the postoperative visual result.

After evaluation, patients with significant posterior segment pathology operated with informed consent about prognosis of vision. Postoperatively every enrolled patient underwent direct examination of the posterior segment, to find out the pathology for further management.

The chi-square test was used for analysis and the value of $p<0.05\%$ was considered significant.

**RESULT**

Two hundred and twenty seven eyes of two hundred patients were included in the study. Twenty-seven patients had bilateral cataract and 6 were only eyed.

Age range was 43 to 81 years with a mean age of 51 years. Of the 200 patients 116 (58\%) were male and 84 (42\%) females. One hundred and twenty eight patients (64\%) were from urban areas and 72 (36\%) belongs rural area. One hundred and twenty six (55.51\%) eyes had only hand movements, 32 (14.10\%) had counting finger within two feet and 69 (30.40\%) eyes had perception and projection to light in four quadrants. One hundred and sixty eyes (70.50\%) had mature, 38 (16.74\%) eyes had nuclear and 29 (12.80\%) had hyper mature cataract.

On B-Scan ultrasonography 18 (7.90\%) eyes had finding suggestive of posterior segment pathology. The most common finding was posterior staphyloma in 8 (3.52\%) eyes followed by vitreous hemorrhage in 3 (1.32\%) eyes, intravitreal membrane, chorioretinal thickening, retinal detachment each was in 2 (0.9\%) eyes and one (0.45\%) eye had optic disc edema. Two hundred and nine eyes (92.10\%) had no posterior segment pathology on ultrasound examination.

Of the 200 patients 163 (81.5\%) had no risk factor for abnormal posterior segment on B-Scan ultrasonography, while 37 (18.5\%) were associated with systemic and ocular risk factors. Among them diabetes, hypertension, early age, presence of posterior synechiae, elevated intraocular pressure and keratic precipitates were frequently seen.

Statistically the value of the test of significance ($p$-value) is of the order of 0.000, which is less than 0.05. this shows that there is association between age-related mature cataracts and posterior segment pathologies.

**Table 1:** Demographic data of 200 patients

<table>
<thead>
<tr>
<th>Sex</th>
<th>Rural</th>
<th>Urban</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>38</td>
<td>78</td>
<td>116</td>
</tr>
<tr>
<td>Female</td>
<td>34</td>
<td>50</td>
<td>84</td>
</tr>
<tr>
<td>Total</td>
<td>72</td>
<td>128</td>
<td>200</td>
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</tbody>
</table>
Table 2: Frequency of posterior segment pathology

<table>
<thead>
<tr>
<th>Ultrasonography observation</th>
<th>Frequency n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pathology observed</td>
<td></td>
</tr>
<tr>
<td>Posterior staphyloma</td>
<td>8 (3.52)</td>
</tr>
<tr>
<td>Vitreous haemorrhage</td>
<td>3 (1.32)</td>
</tr>
<tr>
<td>Intravitreal membrane</td>
<td>2 (0.9)</td>
</tr>
<tr>
<td>Chorioretinal thickening</td>
<td>2 (0.9)</td>
</tr>
<tr>
<td>Retinal detachment</td>
<td>2 (0.9)</td>
</tr>
<tr>
<td>Optic disc edema</td>
<td>1 (0.45)</td>
</tr>
<tr>
<td>Pathology not observed</td>
<td>209 (92.10)</td>
</tr>
<tr>
<td>Total</td>
<td>227 (100)</td>
</tr>
</tbody>
</table>

DISCUSSION

Cataract is one of the leading cause of treatable blindness in developing countries. Many of these cases have advanced cataracts that preclude visualization of fundus prior to cataract surgery. Such visualization is considered important to provide accurate prognosis for vision after cataract surgery. Under such circumstances ultrasonographic examination can provide information regarding such abnormalities.

Age range of patients in this study was 43 to 81 years. Most of the patients (69.85%) were in the range of 50-70 years of age. This is the age where senile cataract is more common. This is more than the study mentioned in American Academy of Ophthalmology which shows that the prevalence of cataracts is 50% in people between the ages of 65 and 74 years.

These age-related cataracts were more common in males (58%) than in females (42%). Probably reason for this is that males have better access to the hospitals and economically more independent than females, who are mostly dependent upon males in our society.

Of the 227 eyes with cataract, 18 (7.90%) eyes were found to have some ultrasonically detectable posterior segment pathologies which was lower than the incidence reported in the study by Anteby et al (19.6%) and very much less than that in the study by Haile and Mengistu who found 66% incidence of detectable abnormalities. On the other hand Bello et al reported very small number of eyes (5.2%) had posterior segment pathology. Ali SI and Rehman H. showed that 11% of the patients of non-traumatic age group were found to have significant posterior segment pathologies.

The most frequent disclosed abnormality was posterior staphyloma in 8 (3.52%) eyes, which is less than that reported by Anteby et al (7.2%). Salman et al reported very small number (2%) of posterior staphyloma.

Vitreous hemorrhage in our study was in 3 (1.32%) eyes. Of these 02 were males and 01 was female. This is less than Ali SI and Rehman H (2.93%) and Anteby II and colleagues (2.5%). While Salmon et al reported (1%) of patients had vitreous haemorrhage in their study.

Retinal detachment was seen in 2 (0.9%) eyes in which 01 male and 01 was female. Both of these had inferior detachment. Anteby and colleagues documented retinal detachment in 4.5%, which is more than our study. While Salman Amjad et al reported 3 (0.7%) cases of retinal detachment, one of them has been associated with vitreous hemorrhage.

Chorioretinal thickening observed in 2 (0.9%) patients. Both were females. This is more than Ali SI and Rehman H (0.12%). This was probably because of choroiditis.

Intravitreal membrane seen in our study in 2 (0.9%) patients, these are not as visually significant as vitreous hemorrhage.

01 female patient (0.44%) was found to have optic disc edema. It could affect the visual outcome of the surgery, so it should be evaluated before surgery.

In this study we observed that certain patients and ocular features could be used as predictors for pathological findings on ultrasonography. Among the patient features studied, diabetes mellitus, hypertension and young age were associated with a significantly greater incidence of abnormalities on ultrasonography. When considering ocular features, presence of posterior synechiae, elevated intraocular pressure and keratic precipitates were associated with a significantly higher incidence of posterior segment pathology.

Ultrasonographic examination can provide information regarding the posterior segment pathology which helps in explaining accurate prognosis postoperatively though in some disorders such as branch and central retinal vein occlusion, macular hole, diabetic maculopathy, optic atrophy could not diagnosed preoperatively. Thus, it is advisable that
patients undergoing cataract surgery should be warned of these limitations of ultrasonography.

In conclusion preoperative posterior segment evaluation with ultrasound in patients with dense cataract can be used to detect pathologies that may influence the surgical strategy and the postoperative visual prognosis.

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