

Preoperative Posterior Segment Evaluation by Ultrasonography in Dense Cataract

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

Pak J Ophthalmol 2009, Vol. 25 No. 3

See end of article for authors affiliations

Correspondence to:
Faheem Ullah Shaikh
Department of Ophthalmology
Liaquat University Eye Hospital,
Hyderabad

Received for publication
October' 2008

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 greenwood¹ 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-Scan² making ultrasound an easy and patient friendly imaging modality. This, and other significant work by Purnell³ and Coleman et al⁴ 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 Ophthalmology⁵⁻⁷.

Its use has expanded to encompass biometric calculations, tissue characterization, diagnosis of complex vitro-retinal conditions and differentiation of intraocular masses⁸⁻¹¹. In the orbit, ultrasound including Doppler, is used for the investigation of extraocular muscles^{12,13} and retrobulbar optic nerve

disease^{14,15} vascular anomalies¹⁶ and orbital mass lesions^{17,18}.

In 1990 Pavlin and colleagues described the first high frequency ultrasound (50-100MHz) in Ophthalmology¹⁹. UBM has allowed us to investigate subtypes of glaucoma, lesions in the iris, ciliary body, sclera, and pars plana²⁰.

Now ultrasound is considered an essential tool in the investigation and management of many ocular and orbital disorders^{21,22}. The evaluation of eyes with opaque ocular media is one of the primary indication for the use of ocular ultrasonography^{23,24}. Therefore preoperative ultrasonography of the globe has been recommended prior to cataract extraction when the fundus cannot be visualized⁹.

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

| Sex | Rural | Urban | Total |
|--------|-------|-------|-------|
| Male | 38 | 78 | 116 |
| Female | 34 | 50 | 84 |
| Total | 72 | 128 | 200 |

Table 2: Frequency of posterior segment pathology

| Ultrasonography observation | Frequency n (%) |
|-------------------------------|-----------------|
| Pathology observed | |
| Posterior staphyloma | 8 (3.52) |
| Vitreous haemorrhage | 3 (1.32) |
| Intravitreal membrane | 2 (0.9) |
| Chorioretinal thickening | 2 (0.9) |
| Retinal detachment | 2 (0.9) |
| Optic disc edema | 1 (0.45) |
| Pathology not observed | 209 (92.10) |
| Total | 227 (100) |

DISCUSSION

Cataract is a 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 abnormalities²⁵

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 years²⁶.

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 al²⁷ (19.6%) and very much less than that in the study by Haile and Mengistu²⁸ who found 66% incidence of detectable abnormalities. On the other hand Bello et al²⁹ 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 pathologies³⁰.

The most frequent disclosed abnormality was posterior staphyloma in 8 (3.52%) eyes, which is less than that reported by Anteby et al²⁷ (7.2%). Salman²⁵ 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. Anteby²⁷ 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 post-operatively 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,

Author's Affiliation

Dr. Faheem Ullah Shaikh
Senior Registrar
Department of Ophthalmology
Liaquat University Eye Hospital
Hyderabad.

Dr. Ashok Kumar Narsani
Assistant Professor
Department of Ophthalmology
Liaquat University Eye Hospital
Hyderabad

Prof. Shafi Muhammad Jatoi
Chairman & Head
Department of Ophthalmology
Liaquat University Eye Hospital
Hyderabad

Prof. Ziauddin A. Shaikh
Chairman & Head
Department of Ophthalmology
DUHS & Civil Hospital Karachi

REFERENCE

1. **Hagan JC, Wyatt B.** preoperative evaluation and workup of the cataract and intraocular lens implant patient. *J Ophthalmol Nurs Technol.* 1993; 2: 123-8.
2. **Ukponmwan CU, Marchien TT.** Ultrasonic diagnosis of orbito-ocular diseases in Benin City, Nigeria. *Niger Postgrad Med J.* 2001; 8: 123-6.
3. **Khan AJ.** Malignant melanoma. *Pak J Ophthalmol.* 1985;1: 3-5.
4. **Hayashi H, Igarashi C, Hayashi K.** Frequency of ciliary body or retinal breaks and retinal detachment in eyes with atopic cataract. *Br J Ophthalmol.* 2002; 86: 898-901.
5. **Blaivas M, Theodore D, Sierzenski PR.** A study of bedside ocular ultrasonography in the emergency department. *Acad Emerg Med.* 2002; 9: 791-9.
6. **Coleman DJ, Silverman RH, Rondeau MJ, et. Al.** Correlation's of acoustic tissue typing of malignant melanoma and histopathologic features as a predictor of death. *Am J Ophthalmol.* 1990; 110: 380-8.

7. **Green RL, Byrne SF.** Diagnostic Ophthalmic Ultrasound in Retina: vol I: Ryan SJ ed. Toronto: The CV Mosby Company. 1998; 1: 191-273.
8. **Gentile RC, Bernstein DM, Leibmann J, et al.** High resolution ultrasound biomicroscopy of the pars plana and peripheral retina. *Ophthalmology.* 1998; 105: 478-84.
9. **Snell RS, Lemp MA.** Clinical Anatomy of eye. Boston: Balck well Scientific Publications, 1989:1
10. **Grayson M.** Diseases of the cornea. St Louis: Mosby, 1983.
11. **Lofstrom JB, Bengtsson M.** A practice of anaesthesia. Physiology of nerve conduction and local anaesthesia drugs. 6th ed. London: Wylie and Churchill Davidson's. 1995; 172-88.
12. **Hogan M, Alvarado J, Weddell J.** Histology of the human eye. Philadelphia: WB Saunders, 1971.
13. **Yoneya S, Tso MOM.** Angio-architecture of the human choroid. *Arch Ophthalmol.* 1987; 105: 681.
14. **Perry HD, Hatfield RV, Tso MOM.** Flourescein pattern of the choriocapillaries in the neonatal rhesus monkey. *Am J Ophthalmol.* 1977; 81: 197.
15. **Khalil AK.** Ultrastructural changes on the posterior iris surface. *Arch Ophthalmol.* 1996; 75: 407.
16. **Davson H.** The Bowman lecture, the little brain. *Trans Ophthalmol Soc UK.* 1979; 99: 21.
17. **Hamilton RC.** Techniques of orbital regional Anaesthesia. *Br. J. Anaesthesia.* 1995; 75: 88-93.
18. **Eisner G.** Biomicroscopy of the peripheral retina. New York: Springer publishing co, 1973.
19. **Apple DJ.** Anatomy and histopathology of the macular region. *Intl Ophthalmol Clin.* 1981; 21:1.
20. **Gissen AJ, Cavino BG, Gregus J.** differential sensitivity of mammalian nerve fibers to local anaesthetic agents. *Anesthesiology.* 1980; 467-74.
21. **Wise GN, Dollery CT, Hankind P.** The retinal circulation. New York: harper & Row Publishers, 1971.
22. **Bellhorn RW.** Control of blood vessel development. *Trans Ophthalmol Soc UK.* 1980; 100: 328.
23. **Rafferty NS.** The ocular lens: structure, function and pathology. New York: Marcel Decker. 1985; 1-60.
24. **Kanski JJ.** Clinical Ophthalmology: A systematic approach. 5th ed. Oxford: Butterworth Heinmann. 2003: 143.
25. **Amjad S, Parmar P, Vanila CG, et al.** Is ultrasound essential before surgery in eyes with advanced cataracts?. *Journal postgraduate Med.* 2006; 52: 19-22.
26. **American Academy of Ophthalmology: Lens and Cataract.** San Francisco 2000.
27. **Anteby II, Blumenthol EZ, Zamir E, et al.** The role of preoperative ultrasonography for patients with dense cataract: a retrospective study of 509 cases. *Ophthalmic Surg Lasers.* 1998; 29: 114-8.
28. **Haile M, Mengistu Z.** B Scan ultrasonography in ophthalmic disease. *East Afr Med J.* 1996; 73: 703-7.
29. **Bello TO, Adeoti CO.** Ultrasonic assessment in preoperative cataract patients. *Niger Postgrad Med J.* 2006; 13: 326-8.
30. **Ali SI, Rehman H.** Role of B-scan in preoperative detection of posterior segment pathologies in cataract patients. *Pak J Ophthalmol.* 1997; 13: 108-12.