Journal of Scientific Research & Reports
8(4): 1-7, 2015; Article no.JSRR.17930
ISSN: 2320-0227

SCIENCEDOMAIN *international*
www.sciencedomain.org

Role of Ultrasound in Eye Diseases in Indian Population

Pankaj Sharma[1*], Rajiv Ranjan[1], Reena Gupta[1] and Amar Dev[2]

[1]Department of Radiology, Deen Dayal Upadhyay Hospital, Delhi, India.
[2]Department of Ophthalmology, Deen Dayal Upadhyay Hospital, Delhi, India.

Authors' contributions

This work was carried out in collaboration between all authors. Authors PS and RR designed the study, wrote the protocol, and wrote the first draft of the manuscript. Authors RG and AD managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JSRR/2015/17930
Editor(s):
(1) Thomas Müller, Department of Neurology, St. Joseph Hospital Berlin-Weissensee, Berlin, Germany.
Reviewers:
(1) Otzem Chassid, Department of Ophthalmology, Bar Ilan University, Israel.
(2) Anonymous, Instituto Mexicano del Seguro Social, Mexico.
(3) Anonymous, Tel Aviv University, Israel.
Complete Peer review History: http://sciencedomain.org/review-history/10237

Case Study

Received 30th March 2015
Accepted 2nd July 2015
Published 19th July 2015

ABSTRACT

Objective: The aim of our study was to evaluate the patients of eye disease by B scan ultrasound and to correlate ultrasonographic findings clinically in patients with ocular diseases.
Materials and Methods: The study was conducted in Department of Radiodiagnosis in association with Department of Ophthalmology at Deen Dayal Upadhyay Hospital, Delhi over a one year period. A total of 50 patients from both inpatient and outpatient department were included in study.
Results: A total of 50 patients with various ocular and orbital abnormalities in the age group from 8 months to 80 years of age were examined. In our series, B scan ultrasound (USG) achieved a sensitivity of 94%, specificity of 100%, positive predictive value of 100% and negative predictive value of 89.47%.
Conclusion: The overall reliability of B scan ultrasonography, and the indisputable value of the information provided, makes B scan evaluation of the eyes with opaque media an essential diagnostic test.

Keywords: Vitrectomy; hemorrhage; choroidal; proptosis.

**Corresponding author: Email: pankajrad7477@yahoo.com;*

1. INTRODUCTION

Ultrasound (USG) is used to detect and diagnose many eye diseases and injuries, to measure the eye prior to corrective surgery and directly as a treatment tool. USG is the most practical method of obtaining images of the posterior segment of the eye, when the light conducting media are opaque and is the most useful investigation prior to vitrectomy. Unfortunately, the Indian literature lacks the uniformity of opinion regarding the efficacies of different methods of echographic evaluation used in ocular trauma. This study was therefore conceived to examine patients of ocular trauma with opaque media and to record the changes of posterior segment using ultrasound. The purpose was to establish the efficacy, sensitivity and specificity of USG diagnosis and to identify any possible limitations of this technique on evaluating the eye postoperatively or during the course of its spontaneous resolution.

2. MATERIALS AND METHODS

The study was conducted in Department of Radiodiagnosis in association with Department of Ophthalmology at Deen Dayal Upadhyay Hospital, Delhi over a one year period. A total of 50 patients from both inpatient and outpatient department were included in study. The patients were selected either for presurgical evaluation or for diagnostic purpose.

The indicators used to select the patients were:

1. Inability to visualize the posterior segment due to :
    a. Corneal lesions
    b. Irregular or poorly dilating pupils
    c. Vitreous opacities
    d. Lenticular opacities
2. To confirm the diagnosis made clinically.
3. A history of an associated ocular inflammatory disease or any other findings suggestive of the same.

A complete clinical data of the patients signs and symptoms were taken. Findings of other clinical investigations and follow up were noted.

All patients were subjected to USG examination after taking informed consent. Ocular USG was done on GE Synergy and Philips (En Visor) using 6 and 10 MHz transducers. All these patients were subsequently operated upon and had their findings confirmed.

3. RESULTS

This was a prospective and descriptive study. The number of males and females studied were 32 (64%) and 18 (36%) respectively in our study population (Table 1). The age group studied ranged from 8 months to 80 years age (Table 2). Out of 50 patients in our series, 46 patients had opaque media and 4 patients had clear media (Table 3).

Total 27 patients had ocular trauma in our series. Right eye was involved in 15 patients and left eye was involved in 12 patients. The cases of trauma were evenly distributed in all age groups.

The patients were classified in following categories: Corneal opacity, lenticular opacity, vitreo-retinal abnormalities, tumors, intraocular foreign body (IOFB) and miscellaneous conditions like vitreous collection, choroidal detachment and inflammatory conditions.

The largest group in our series of 50 patients, was the group diagnosed as normal (with no visual loss) in patients (17 patients), but presented with opaque media due to trauma or cataract, and to rule out any vitreo-retinal abnormalities. 16 patients had vitreous hemorrhage in our series. The third largest group of patients were those diagnosed as having retinal detachment (14 patients). Out of 14 patients, 11 patients had complete retinal detachment, whereas 3 patients had partial retinal detachment. The primary retinal detachment was seen in 1 patient whereas secondary retinal detachment was seen in 13 patients.

The fourth group of patients were those diagnosed as having intra-ocular tumors (3 patients). 2 patients had retinoblastoma and were in the age group of 4 to 9 years. 1 patient was found to have a retrobulbar mass diagnosed pathologically as optic nerve glioma.

The fifth group of patients were diagnosed as having IOFB (3 patients). The ultrasonographic diagnosis was made in 2 patients and 1 patient was reported as false negative. In 1st patient, IOFB was located in the anterior chamber and in 2nd patient IOFB was seen in the vitreous cavity and secondary changes were noted, like vitreous hemorrhage and panophthalmitis. In both

patients, metallic foreign body was seen. In the false negative case, the foreign body was a plastic material and was partly embedded in the sclera.

The miscellaneous group accounted for 20% of patients seen. It comprised of patients with varying problems like choroidal detachment, vitreous collection, posterior vitreous detachment, coloboma and inflammatory conditions.

In our series, B scan USG achieved a sensitivity of 94%, specificity of 100%, positive predictive value of 100% and negative predictive value of 89.47%. We were unable to detect plastic material IOFB partly embedded in the sclera in 1 patient and vitreous hemorrhage in 1 patient in our series.

Table 1. Sex distribution in total number of cases

Total number of patients	50
Male	32
Female	18

Table 2. Age and sex wife distribution in total number of cases

Age group	Total cases	Male	Female
0-1	1	0	1
1-10	5	4	1
11-20	6	2	4
21-30	9	8	1
31-40	10	5	5
41-50	9	7	2
51-60	4	2	2
61-70	5	3	2
71-80	1	1	0

Table 3. Basis of referral for ultrasonographic examination

Opaque media (46)	
Corneal Opacity	3
Pupillary abnormality	1
Lenticular Opacity (Cataract, trauma)	30
Vitreo-Retinal abnormalities	26
Intraocular Foreign body	4
Inflammatory cases	1
Clear media (4)	
Tumor	2
Exoophthalmos	1
Post-operative (IOL)	1

4. DISCUSSION

Mundt and Hughes [1] in 1956 first described the use of pulse echo (A-scan) technique in the detection of intra-ocular tumors. Further work on the fundamentals of A scan diagnosis was carried out by Oksla [2]. Greenwood [3] developed the first B scan for ophthalmic use employing an immersion technique. However it was not until 1972, when Bronson and Turner [4] produced the first contact B scan method, that USG became a more practical investigation. This method made the examination easier to perform, less time consuming and more acceptable to patients.

In 1960, Ossoining KC [5,6] first emphasized the importance of standardizing instrumentation and techniques. He developed first standardized A-scan instrument, the Kretztechnik 7200 MA. He later added use of contact B-scan instrument and devised meticulous examination techniques for use with the two instruments. This concept eventually evolved into what is known today as Standardized Echography.

USG has the advantage of rapidity and accessibility and with its ability to identify the orbital walls, optic nerve, extraocular muscles and orbital masses, is a useful investigation in the evaluation of the orbits. With the use of high resolution USG, there has been a marked improvement in the visualization of the orbital structures. USG is an ideal method for imaging the eye and is relatively inexpensive, widely available and has no radiation hazard [7,8].

The growing field of pediatric ophthalmology has led to many advances in diagnosis and management and this is shown in the relatively large number of children studied (12 children). 2 children had retinoblastoma in our series.

In the middle age group from 21 to 40 years, 19 patients were studied. These were mainly cases of trauma, concomitant ocular inflammatory diseases or lenticular opacities which were either past or acquired opacities whether traumatic, complicated or studied as presenile cataracts. The diagnosis in this age group included vitreous hemorrhage secondary to ocular trauma, retinal detachment and choroidal detachment. A female patient with a history of heaviness in left eye, increase in size of eye and proptosis was found to have a retrobulbar mass diagnosed pathologically as optic nerve glioma. Other findings included choroidal coloboma.

Fig. 1. Image showing vitreous haemorrhage with retinal detachment

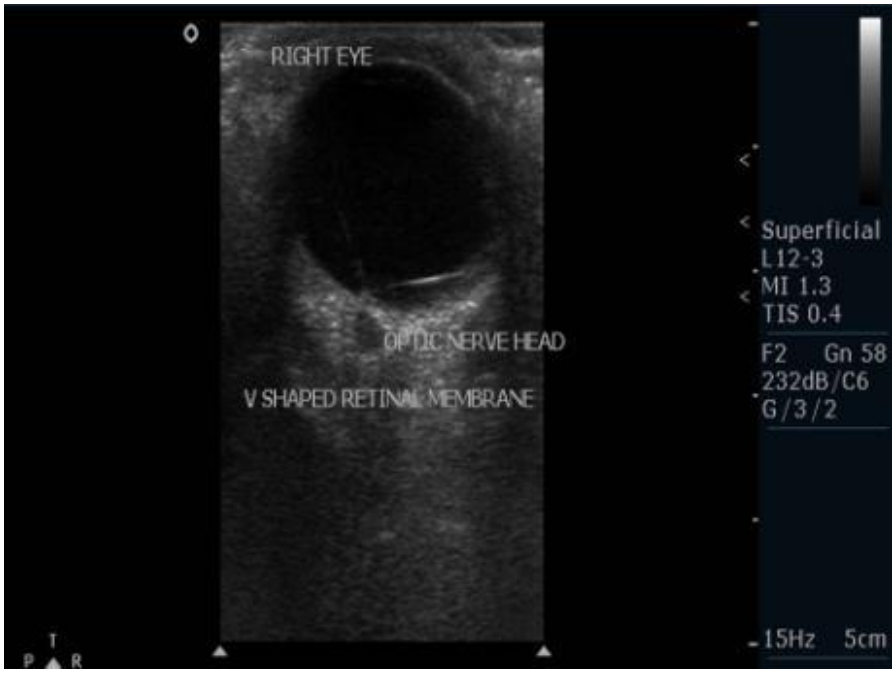

Fig. 2. Image showing optic nerve head with retinal detachment

In the age group of 41 to 60 years, 13 patients were studied. Most of the patients had senile cataract and were referred for preoperative evaluation. 6 patients were older than 60 years. In this age group also most of the patients had senile cataract. In one case, vitreous hemorrhage with secondary retinal detachment was seen. In another case of ocular trauma, complete retinal detachment and choroidal detachment was seen.

The largest group of opacities was the subgroup of lenticular opacities (cataract). The second largest subgroup was vitreal opacities which was more common in the older age group and in those who were known cases of systemic illnesses such as diabetes or hypertension.

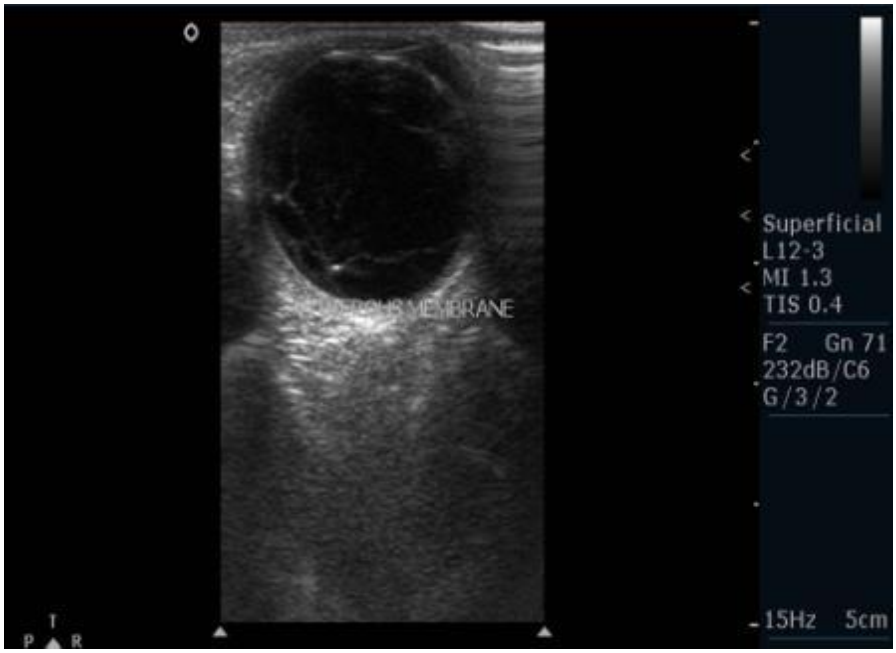

Fig. 3. Image showing presence of vitreal membranes

Fig. 4. Image showing presence of cataractous lens, retinal detachment and fluid-fluid level

Fig. 5. Image showing presence of cataractous lens with vitreal hemorrhage

Fig. 6. Image in trauma patient showing presence of air foci with vitreous haemorrhage

Table 4. Reliability of ultrasonographic diagnosis

Ultrasonographic diagnosis	Total number of cases	Mode of verification of ultrasonographic diagnosis (by pathology)	Correct diagnosis (No & %)	Wrong diagnosis (No & %)
Normal	17	17	17 (100%)	0
Vitreous hemorrhage	16	16	15 (94%)	1 (6%)
Retinal detachment	14	14	14 (100%)	0
Tumors	3	3	3 (100%)	0
Intraocular foreign body	3	3	2 (67%)	1 (33%)
Miscellaneous	10	10	10 (100%)	0

5. CONCLUSION

USG evaluation provides the surgeon with maximum information prior to surgical exploration, enabling optimal patient management. USG does not provide a tissue diagnosis, although frequency and reflectance characteristics do provide insight of the character of a lesion. Repeat examination, showing changes at a later time, can add even more information. Even considering these factors, the overall reliability of B scan ultrasonography, and the indisputable value of the information provided, makes B scan evaluation of the eyes with opaque media an essential diagnostic test.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Mundt GH, Hughes WE. Ultrasonics in ocular diagnosis. Am J Ophthalmol. 1956;14:488-498.
2. Oksala A, Lehtinen A. Diagnostic value of ultrasonics in ophthalmology. Ohthalmologica. 1957;134: 387-395.
3. Baum G, Green Wood I. The application of ultrasonic locating techniques to ophthalomology. Theoretic considerations and acoustic properties of ocular media: Part 1. Reflective properties. Am J Ophthalmol. 1958;46:319-329.
4. Bronson NR, Turner FT. A simple B scan ultrasonoscope. Arch Ophthalmol. 1973; 90:237-238.
5. Ossoinig KC. Quantitative echography: The basis of tissue differentiation. J Clin Ultrasound. 1974;2:33.
6. Ossoinig KC. Standardized echography: Basic principles, clinical application and results. Int Ophthalmol Clin. 1979;19(4): 127-210.
7. Coleman DJ, Woods S, Rondeau MJ, Silverman RH. Ophthalmic ultrasonography. Rad Clin of North Am. 1992;30(5):1105-1111.
8. Mc. Nicholas MMJ, Brophy DP, Power WJ, Griffin JF. Pictorial essay: Occular sonography. Am J of Rad. 1994;163:921-927.

Peer-review history:
The peer review history for this paper can be accessed here:
http://sciencedomain.org/review-history/10237