Comparing Ultrasound and CT for Diagnosis of Ocular Disorders

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Introduction: USG is the first imaging technique in suspected intraocular tumors. Ultrasound has revolutionized the management of the traumatized eye. Study was done to evaluate, characterize and gives a diagnosis of ophthalmic disorders, eye injuries with the help of B scan and to correlate the findings with orbital CT scan.

Material and methods: Study was conducted in Patna Medical College Hospital, from October 2013 to September 2015 in the department of Radiodiagnosis, on 82 patients (84 eyes) of different age groups in both sexes. Patients were referred from Department of Ophthalmology for evaluation of posterior segment eye disorder.

Result: Maximum number of patients were in the age group of 21-50 years. Sex distribution revealed more number of cases in male. Most common presenting feature is low vision. Total eyes studied 84, out of that in 41 cases posterior segment abnormalities found.

Conclusion: B-scan found was to be reliable, safe and rapid investigation. B-scan helps in evaluating the posterior segment in the presence of opaque ocular media and is useful for preoperative planning. B-mode ultrasonography should be the first screening modality in evaluation of intraocular lesions before resorting to much costlier investigations like CT and MRI.

Keywords: Ultrasound, CT, Ocular Disorders

INTRODUCTION

Although the eyes represent only 0.1% of the total body surface and only 0.27% of the anterior body surface which significance to individual and society is disproportionately higher. Ophthalmic ultrasonography is broadly divided into A- scan and B-scan. A-scan can be used for biometric calculation and for quantifying the reflectivity of lesions in the eye and orbit. 20 MHZ probe is ideally suited for ultrasonographic evaluation of the lens and anterior vitreous. A 50MHZ probe is used for anterior segment ultrasonography which is called as Ultrasound Biomicroscopy. Detection of significant abnormalities using ultrasound prior to cataract surgery[1] helps in planning surgery and allows the surgeon to provide an appropriate prognosis to the patient. Ultrasound has revolutionized the management of the traumatized eye.[2] USG is the first imaging technique in suspected intraocular tumors[3] and is very useful in diagnosis. Choroidal tumors are seen in adults. The presence of extrascleral extension of choroidal melanoma is a vital sign, not likely to be detected by any mean other than B-scan ultrasound.[4]

The orbit forms an ideal organ for CT imaging because of large differences in the attenuation coefficient of globe, muscles, nerve, vessels and retro-bulbar fat. The use of thin sections with multiplanar scanning (axial, coronal and sagittal planes) and the possibility of three-dimensional reconstruction permits logical in-vivo analysis of morphology and pathology, providing in turn a deeper understanding of the nature and spread of disease affecting this vital area.[5]

So this study was done to evaluate, characterize and gives a diagnosis of ophthalmic disorders, eye injuries with the help of B scan and to correlate the findings with orbital CT scan.

MATERIAL AND METHODS

The present study was a hospital based prospective study, conducted from October 2013 to September 2015 in the department of Radiodiagnosis, Patna Medical College, Patna. Patients were referred from Department of Ophthalmology for evaluation of posterior segment eye disorder. 82 patients (84 eyes) of different age groups in both sexes were taken up randomly for sonographic study with a 12 MHZ transducer linear probe ultrasound machine model P3, by GE, and patients presenting with proptosis with a clinical suspicion of intraocular pathology formed the main selection group for ultrasonographic scan. Patients having blunt trauma to eyes and with clinical suspicion of intraocular pathology were included in the study. Patients with orbital trauma were excluded. Study was conducted after informed consent from patients, to evaluate, characterize and gives a diagnosis of ophthalmic disorders, eye injuries with the help of B scan and to correlate the findings with orbital CT scan.

STATISTICAL ANALYSIS

Descriptive statistics like mean and percentages were used to represent results. Microsoft office 2007 was used to make tables.

RESULT

82 patients (84 eyes) of different age groups in both sexes were included in the study. Maximum numbers of patients (39) were in the age group of 21-50 years then 19 cases were in patients more than 50 years. 18 cases were in age groups of 5-20 years and 8 cases were seen in patients under 5 years. Sex distribution revealed more number of cases in male (76%) (table-1).

Maximum cases of abnormal USG and CT were of traumatic origin followed by cases of suspected intraocular pathology. The case of leukocoria was less common but there was high

Age in years	No. of eyes	Male (%)	Female (%)
<5	8	7(8.3%)	1(1.19%)
5-20	18	15(17.86%)	3(3.57%)
21-50	39	30(35.59%)	9(10.71%)
>50	19	12(14.29%)	7(8.33%)
Total	84	64(76%)	20(24%)
Table-1: Age and sex distribution			

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	Abnormal USG	Normal USG	Abnormal CT	Normal CT
Cataract patient	10(27)	27(67.5)	2(10.5)	17(89.4)
Trauma patient	15(51.7)	14(48.3)	7(43.7)	12(56.2)
Suspected intraocular pathology	11(80)	2(20)	3(50)	3(50)
leukocoria	5(100)	0(0)	5(100)	0(0)
Total	26	57	11	34
Figures in parenthesis indicates percentage				

Table-2: B scan and CT findings

	USG No. of eyes	CT No. of eyes
Retinal detachment	6	2
Vitreous haemorrhage	2	0
Posterior vitreous detachment	2	0
Normal	27	17
Total	37	19

Table-3: Preoperative status of B scan (40 eyes) and CT scan (19 eyes) findings in cataract patients

Findings	USG (no. of eyes)	CT (no. of eyes)
Vitreous haemorrhage	6	2
Choroid detachment	1	1
Retinal detachment	3	0
Foreign body	1	1
RD + CD	1	0
Endopthalmitis	1	1
Pthisis bulbi	2	2
Normal	14	9
Total	29	16

Table-4: B scan and CT scan findings in trauma patients:

	No. of cases (%) USG	No. of cases (%) CT
Retinal detachment	9(9.3)	3(3.5)
RD+VH	1(2.3)	1(1.1)
Retinoblastoma	4(4.7)	4(4.7)
RD + CD	1(2.3)	0
Coloboma	1(2.3)	1(2.3)
Total	16	10

Table-5: Findings of retinal disorders on B mode USG scanning:

	No. of eyes (USG)	No. of eyes (CT)
Normal	2	0
Vitreous haemorrhage	2	1
Retinal detachment	2	0
Coloboma	2	2
Chorioretinitis	2	2
Tumor infiltrating globe	1	1
VH+PVD	1	0
RD+VH	1	0
Total	13	6

Table-6: B scan and CT scan findings in patients with clear media with suspected intraocular pathology:

diagnostic accuracy of both ultrasound and CT scan (table-2).

In cataract patients 10 eyes out 37 eyes (27%) and 2 out of 19 eyes (10.5%) had findings suggestive of posterior segment pathology on USG and CT scan respectively. The most common finding was retinal detachment in 6 eyes on USG and in 2 eyes

on CT, followed by vitreous opacities/haemorrhage in two eyes and posterior vitreous detachment in 2 eyes on USG. Twenty seven eyes (84.5%) and 17 eyes (89.4%) have a normal posterior segment on USG and on CT respectively. 2 eyes had bilateral cataract. Both vitreous opacities/haemorrhage and posterior vitreous detachment were not detected on CT (table-3).

The study describes the findings in 15 eyes out of 29 eyes on USG and 7 eyes out of 16 eyes on CT of ocular trauma of varied causes. USG delineate pathological lesions in the posterior segment in as high as 48.3% of cases where as CT delineate pathological lesions in 43.7% of the cases. Out of this one case revealed intraocular foreign body on both USG and CT (table-4).

The most frequent findings recorded on both ultrasound and CT amongst the group under consideration was that of vitreous haemorrhage.

A total of 82 patients (84 eyes) and 42 patients(44 eyes) examined on B mode USG and CT respectively, 16 retinal disorders were diagnosed on B mode USG and 10 retinal disorders were diagnosed on CT scan as shown in table-5.

In cases of clear media with suspected intraocular pathology, the cases are evenly distributed between vitreous haemorrhage, retinal detachment, coloboma and chorioretinitis (table-6).

DISCUSSION

Maximum number of patients were in the age group of 21-50 years. Sex distribution revealed more number of cases in male. Most common presenting feature is low vision. Total eyes studied 84, out of that in 41 cases posterior segment abnormalities were found.

Table-2 shows cataracts constiue an important cause of blindness in developing countries such as india and many of these cases have advanced cataracts that preclude visualization of fundus prior to cataract surgery. Under such circumstances ultrasonographic examination can provide information regarding such abnormalities

We noted the occurence of significant posterior segment abnormalities on USG in 41 cases (48.8%). Most patients in developing countries have never had an opthalmic examination till they present to the hospital with an advanced cataract for surgery. We noted the occurence of significant posterior segment abnormalities on USG in 41 cases (48.8%) out of 84 eyes reffered from department of ophthalmology, which is higher than the incidence reported in the study by Salman et al[6] (because in their study they excluded patients with a definite history of trauma) and Byme et al[7] and lee than that in the study by Hajir Dadgostar[8] who found a 66% incidence of detectable abnormalities.

In table-3 the results shows that ultrasound is an accurate mehod of diagnosing vitreous haemorrhage which was also concluded

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by Lindgren G et al.[9] This is important in cases where vitreous haemorrhage is suspected behind dense cataract, posterior synechia etc. In the majority of cases an underlying pathology was identified on ultrasound. In cases where retinal breaks are suspected, serial ultrasound examinations are required to detect early development of retinal detachment or until media is sufficiently clear to allow fundoscopy. CT was found to be much inferior to USG in detecting posterior segment pathology especially vitreous haemorrhage.

Table-4 shows the most frequent findings recorded ultrasonically, amongst the group under consideration was that of Viteous Haemorrhages, which is almost similar to the incidence reported in the study by Bhatia et al.[10] The various other changes which could be detected were retinal detachment, choroid detachment and intraocular foreign bodies. The vitreous veil and dislocated lens simulated the retinal detachment

Table-6 shows, in clear media ultrasound played a significant role in the detection and differentiation of mass lesions. It is arguably the most accurate mean of tissue differentiation and measurements of raised intraocular tumours.[11]

The echographic investigation of leucocoria is an essential component of the management of children with this condition and in the differentiation of its common caauses.

CT was found to be 100% sensitive in detection of retinoblastomas (all the 4 suspected cases of retinoblastoma on USG were confirmed on CT.

Table-5 shows an incidence of 9.3% (9 out of 84 cases examined) of RD due to traumatic and non traumatic causes while studies of Byme et al[12] showed 7.6% and Coleman DJ[13] showed 25%. Bounik M et al[14] in their study of cataract patients found 41 cases of RD among 295 patients screened for posterior segment abnormality accounting for 13.8% of all abnormalities. Comparitively, in our study RD was due to non-traumatic causes accounted for 8.3% (7 out of 84 cases including one case of RD with VH) and these were observed in cataract cases that were screened for evaluation of posterior segment preoperatively. Five cases of traumatic RD (including one case of RD with CD) was found.

On CT correlation of the USG detected RD only 3 cases out of eleven (including 1 case of RD with VH and 1 case of RD with CD) showed RD and one case showed RD with VH.

All the five patients studied in the series for evaluation of leukocoria were correctly diagnosed on both USG and CT. Four of them had Retinoblastomy and one case had bilateral PHPV.

CONCLUSION

B-scan is a reliable, safe and rapid investigation. B-scan helps in evaluating the posterior segment in the presence of opaque ocular media. It is useful for preoperative planning. B-scan is the preffered screening modality in extraocular lesions and also it is a feasible option in rural centres.

REFERENCES

1.   Hajir Dadgostar, Alexandre A.C.M. Ventura, Brandy C Hayden, Posterior segment trauma. Ultrasound Clinics. 2008;3;25.
2.   H.R Atta, New applications in ultrasound technology, British Journal of ophthalmol. 1999;83:1246-1249.
3.   Scott IU, Smiddy WE, Feuer WJ, Ehlies FJ. The impact of echography on evaluation and management of posterior segment disorders. Am J Opthalmol. 2004;137:24-9.
4.   Pavlin CJ, Sherar MD,Foster FS. Subsurface ultrasound microscopic imaging of the intact eye. Ophthalmology. 1990;97:244-250.
5.   Coleman, D. J., Reliability of ocular and orbital diagnosis with B-scan ultrasound. American journal of ophthalmology. 1972;73:501-516.
6.   Salman Amjad; Parmar P; Vanila C; Thomas P; Nelson Jesudasan C, is ultrasonography essential before surgery in eyes with advanced cataracts. Journal of PG medicine. 2006;52:19-21.
7.   Byme SF, Ronald L, Green MD. Ultrasound of the Eye and Orbit. 2nd ed. St. Louis: Mosby, 2002.
8.   Hajir Dadgostar, Alexandre A.C.M. Ventura, Brandy C. Hayden, Posterior Segment Trauma, Ultrasound Clinics. 2008;3;2-5.
9.   Lindgren G, Lindblom B. Causes of Vitreous hemoorhage. Curr Opin ophthalmol. 1996;7:13-19.
10. Bhatia IM, Panda A, Dayal Y, Role of ultrasonography in ocular trauma, indian J Ophthalmol. 1983,31;5:495-498.
11. Spraul CW, Grossnikalus HE. Vitreous hemorrhage. Surv ophthalmol. 1997;42:3-39.
12. Byme SF, Green RL. Ultrasound of the eye and orbit. St Louis:Mosby. 1992:133-213.
13. Coleman DJ, Jack RL, Franzen LA.Ultrasonography in ocular trauma. A m J Ophthalmol. 1973;75:279-288.
14. Bounik M, Zimmerman L. Problems in differentiating idiopathic serous detachments from solid retinal detachments. Int ophthalmol clin. 1962;2:411.