ORIGINAL ARTICLE

USEFULNESS OF ULTRASOUND TECHNOLOGY IN CASES OF OCCULAR TRAUMA ATTENDING TERTIARY EYE CARE CENTER IN MEDICAL COLLEGE IN SEMI URBAN AREA IN GUJARAT

Jyotindra N Brambhatt[1], Akshay V Sahayata[2], Mansi V Sahayata[3], Himani V Chavda[4]

Author's Affiliations: [1]Professor, [2]Resident, [4]Intern, Dept of Opthalmology, C.U.Shah Medical College, Surendranagar; [3]Radiologist, CIAMS Hospital, Ahmedabad, Gujarat
Correspondence: Dr. Jyotindra.N.Brahmbhatt E-mail: drjbrahmbhatt@gmail.com

ABSTRACT

Introduction: Ultrasound scan is a medical test that uses high frequency sound waves for imaging. Ultrasound technology is useful for diagnosis, differentiation of nature of various traumatic intraocular conditions and helpful in planning the line of management.

Materials and Methods: This study was conducted after getting permission from ethical committee. study period is from January to June 2016 in the patients of ocular injuries. After primary documentation patients were examined with tourch light, Snellen's chart, slit-lamp and indirect and direct ophthalmoscopic examinations. Then sent for ultra sonography in radiology department for b-scan. We planed the treatment after assessing the clinical and b-scan findings.

Results: In 6 months of our study 54 patients of ocular injuries were examined. Out of 54 patients, 26(48.14%) patients having positive usg findings. The positive usg findings were vitreous haemorrhage, detachment and verities, Retinal detachment and hyphema. Clinically these findings are difficult to detect in emergency cases, So help of ultrasonography technique is required.

Conclusion: Ultrasound scan is a useful imaging modality in patients with Ocular trauma for diagnosis of various ocular conditions. It will help the surgeon to plan medical or surgical treatment in majority of ocular trauma cases.

Keywords: Ocular trauma, ultrasonography, retinal detachment, vitreous haemorrhage, corneal foreign body

INTRODUCTION

Ocular emergencies account for 3% of all emergency department visits. Ocular symptoms are some of the most challenging to evaluate in a busy emergency department. 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.[1] Ultrasound is an acoustic wave in which compressions and rarefactions occur due to changes in density within fluid and solid Substances.[2] The time required for sound to travel to the rear of the eye and return is only about 33 microseconds (1 microsecond equals 1 millionth of a second.[3] A system that incorporates a gray scale with many steps of gradations of gray, ranging from black to white, is quite desirable since the relative brightness of a displayed echo helps the examiner in identifying the corresponding tissue.[4] Ocular emergencies account for 3% of all emergency department visits. Ocular symptoms are some of the most challenging to evaluate in a busy emergency department. Various recording systems are available so that each photo can be labelled as to which of the infinite cross sections it represents.[5] If the echo persists at low sensitivity, the membrane is more likely to be retina, whereas if it disappears early, a vitreal membrane is the more likely Diagnosis.[6] Lens opacification and hyphema can also block the posterior view of the chamber. Ultrasound technology and adaptation in emergency has led to accurate diagnosis and timely intervention of many emergency conditions like Lens subluxation, vitreous haemorrhage, retinal detachment, vitreous detachment and intraocular foreign body. The eye is fluid-filled structure, it provides a perfect acoustic window, producing images with excellent detail. The normal eye appears as a circular hypoechoic structure. Direct visualization of intraocular structures is

difficult or impossible sowe used USG. Blunt trauma can lead to posterior scleral rupture that may be difficult to detect clinically and exact location with respect to other ocular structures.[7-10]Hence b-scan investigation is mandatory.

METHODOLOGY

This was a prospective cross sectional study. we have started study after getting permission from college ethical committe From 01/01/2016 to 30/06/16 all the ocular injury patients attending emergency department of C.U.Shah medical collage and hospital, Surendranagar,Gujarat. After taking written consent total 54 ocular injury cases were registered. We have recorded name, age, sex, occupation, address and type of injury of all patients. we have examined them with torch light, snellen's chart, slit lamp and indirect and direct ophthalmoscope. Majority injury patients were males 45(83.33%) and only 9(16.66%) were females. Then primary treatment like wound repair, foreign body removal and dressing done. Then patients were sent for ultra sonography in radiology department for b-scan.

Inclusion criteria: Patients fulfilling all of the below criteria were included in the study

1. Diminision of vision or total loss of vision.
2. Ocular trauma with head injury.
3. Severe ocular pain.
4. Suspected intraocular foreign body.

Exclusion criteria: Patients fulfilling any of the below criteria were excluded in the study

1. The patients having past history of intra ocular injuries.
2. Unco-operative patients.
3. Patient refuses for written consent.

Imaging Technique: A high resolution 10-12 MHz or higher linear array ultrasound transducer is used to perform An ocular examination. Ocular ultrasonography is performed using a close eye technique. A standard water-soluble Ultrasound transmission gel should be applied to the patients closed eyelid so that the Transducer doesn't have to touch the eyelid. Ultrasound gel is not detrimental to eye. The globe should be scanned in both sagittal and transverse planes. The patient is asked to look straight ahead with eyes closed, but without clenching the Eyelids. Depth and Gain should be adjusted to obtain acceptable good image. So in co-operative patients you can diagnose posterior segment injury at the time of emergency.

RESULTS

This was prospective cross-sectional study. A chi-square test was performed and no significant relationship was found between Diseases caused by blunt injury and penetrating injury (Yates Chi-Square (9, N=54)=4.418,P=0.88). There is also no significant difference between age and type of injury. (Yates Chi-Square (6,N=54)=7.237, P=0.299)

We found males are more prone to injuries because of their exposure to external work.

Eye injury is more common in our study group between 40-60 years.

Table 1: Age Distribution (N=54)

Age (in Years)	No (%)
0-20	5(9.25)
20-40	20(37.03)
40-60	23(42.59)
above 60	6(11.11)

Table 2: Type of Trauma (N=54)

History of Trauma	No (%)
Metal Trauma	18 (33.33)
Blunt Trauma	8 (14.81)
Wooden Trauma	8 (14.81)
Accidental Trauma	5 (9.25)
Fire Cracker Injury	4 (7.40)
Sharp Instrument Trauma	3 (5.55)
Stone Trauma	3 (5.55)
Knife Injury	2 (3.70)
Corneal Foriegn Body	1 (1.85)
Head Injury, Blurred Vision	1 (1.85)
Recurrent Uveities Trauma Due To Fall Down	1 (1.85)

Table 3: Signs detected on examination (N=54)

Occular Findings	No. (%)
Corneal Fb	24 (44.44)
Ac Reaction	5 (7.40)
Hyphema	4 (5.55)
As-Wnl	3 (9.25
U.L. Clw	5 (5.55)
Ll Clw-Sch	2 (3.70)
K.Tear	2 (3.70)
Corneal Tear	2 (3.70)
Ac.Flattening	2 (3.70)
Anterior Uveitis	2 (3.70)
Traumatic Cataract	2 (3.70)
Fungal K. Ulcer	1 (1.85)
K. Ulcer	1 (1.85)
Hypopyon	1 (1.85)
Corneal Perforation	1 (1.85)
K. Oedema	1 (1.85)
Conjuctival Fb	1 (1.85)
K. Ulcer With Perforation	1 (1.85)
Epithelial Defect	2 (3.70)
K. Membrane	1 (1.85)

Table 4: USG Findings (N=54)

USG B-SCAN FINDINGS	No (%)
VH	5 (9.25)
RD	5 (9.25)
Vetrous Detachment	4 (7.40)
Hyphema	3 (5.55)
Vetrities	3 (5.55)
Vitrous Degeneration	1 (1.85)
Optic Nerve Druses	1 (1.85)
Globe Perforation With Inferior Hemorrage	1 (1.85)
Panophthalmities	1 (1.85)
Traumatic Cataract	1 (1.85)
Cd. Subchoroidal Effusion	1 (1.85)

Table 5: Age, sex and laterality distribution in ocular injury (N= 54)

Age	Type	No.	Male	Female	B/E	R/E	L/E
01-10	B	-	-	-	-	-	-
	P	3	3	-	-	1	2
11-20	B	1	1	-	-	1	-
	P	1	1	-	-	-	1
21-30	B	9	8	1	1	5	3
	P	1	1	-	-	-	1
31-40	B	7	7	-	-	4	3
	P	4	3	1	-	1	3
41-50	B	11	9	2	1	2	8
	P	1	1	-	-	-	1
51-60	B	9	5	4	1	2	6
	P	4	3	1	-	2	2
61-70	B	3	3	-	-	3	-
	P	-	-	-	-	-	-

(B=Blunt; P=Penetrating)

Table 6: USG findings and type of injury (N=26)

USG findings in type of injury	Blunt injury	Penetrating injury
VH	5	-
RD	5	-
Vitreous detachment	4	-
Hyphema	1	2
Verities	2	1
Vitreous detachment	1	-
Optic nerve drussen	1	-
Globe perforation with inferior haemorrhage	-	1
Panophthalmitis	-	1
Traumatic cataract	-	1
Subchoroidal effusion	-	1

In our study maximum patients having trauma with metal -19 (35.18%). And Blunt and Wooden trauma – 8 (14.81%) each. Most common cases were of corneal foreign body and lid tear.

In our study, Vitreous haemorrhage and Retinal detachment was found in 5 (9.25%) each, Vitreous Detachment in 4(7.40%), Hyphema and Vitrities in 3(5.55%) each and 1(1.85%) each.

Patients in 20-60 years age group were commonly exposed to blunt injury. Patients in the middle age group and young children were common in penetrating injury.

Vitreous haemorrhage and retinal detachment were more common in the patients with blunt injury. In our study corneal foreign body were detected in 24 (44.44%)patients, CLW in 5(9.25%) patients and hyphema in 4(7.40%) patients.

DISCUSSION

Anatomy on B-Scan: The cornea is seen as a thin hypoechoic layer parallel to the eyelid. The anterior chamber is filled with anechoic fluid and is bordered by the cornea, iris and anterior reflection of the lens capsule. The iris and ciliary body are seen as echogenic linear structures extending from the peripheral globe towards lens. The normal lens is anechoic. The normal vitreous chamber is filled with anechoic fluid. Vitreous is relatively echo lucent in a young healthy eye. Sonographically, the normal retina cannot be differentiated from the other choroidal layers. The evaluation of the retro bulbar area includes: optic nerve, extra ocular muscles and bony orbit. The optic nerve is visible posteriorly as a hypoechoic linear region radiating away from globe. The eye is a fluid-filled structure, it provides a perfect acoustic window, producing images with excellent detail. The normal eye appears as a circular hypoechoic structure. So we can diagnose hidden ocular pathology in emergency. The prevalence of ocular trauma in young patients 20-40 years group (20 cases- 37.03%)which is in comparison with those reported by Mirza Shafique et al 91% (90 cases) due to our short series of cases.[11] In our study corneal foreign body were detected in 24 (44.44%)patients. It is due to occupational hazards in comparison with other national studies carried out by Uzma Fasih et al – 72%12 and butt NH et al – 54%.[12-13].

Ultrasound images of important cases

A patient presented with H/O fungal ulcer in left eye B-scan of left eye showing showing membrane with internal echoes in the posterior segment which appears mobile and not attached to optic disc **s/o vitreous detachment**

Figure 1: case of vitreous detachment

B-scan of a patient presented with H/O blunt trauma to the left eye before 6 months showing **Retinal detachment** *with* thick organised **Hematoma** in the posterior segment

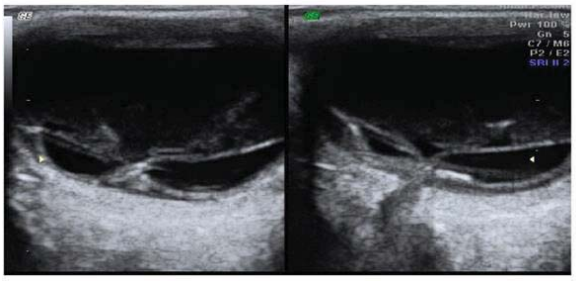

Figure 2: Case of retinal detachment

A patient presented with H/O trauma to right eye by wooden stick before week followed by loss of vision B-scan showing echogenic thickening of wall ofright orbit with irregular heterogeneously echogenic area in the posterior segment , Anterior segment and lens could not identified s/o Panophthalmitis.

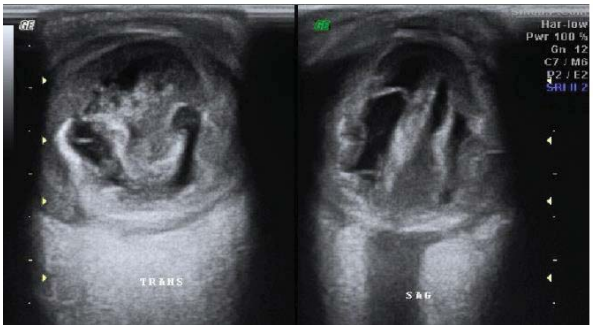

Figure 3: Case of panophthalmitis

A female patient presented with H/O head injury followed by throbbing headache and blurring of vision with photophobia since 15 days, **B-scan** of right eye showing echogenic focus with distal acoustic enhancement in both eyeballs in the region of optic discs favouring **Optic Nerve Drusen.**

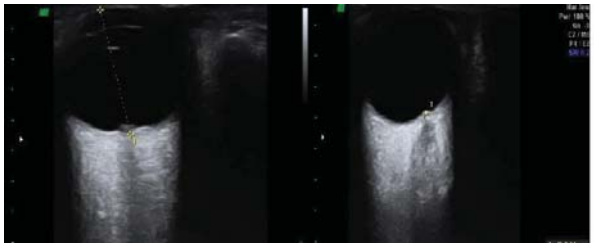

Figure 4: Optic nerve drusen

In study of par tab rai etc in 2007, out of 72 patients USG findings were Vitreous haemorrhage in 21 (29.1%), Retinal Detachment in 13 (18.05%), Vitreous Detachment 3 (4.16%), Hyphema – 9 (12.5%), Cataract 28 (38.88%), Vitreous degeneration, optic nerve Drusen, Panophthalmities, Subchoroidal effusion And Globe perforation with inferior haemorrhage in none. In our study 1 (1.85 %) in each case.[14]

In our study, Vitreous haemorrhage, Retinal Detachment , Hyphema , Cataract and Vitrities Cases are less may be due to inclusion of all injury cases in our study and Par tab Rai study All referred patients are included.

CONCLUSION

Eye injury is commonest cause of visual loss in children and industrial workers which can be prevented by safety measures. Ultrasound scan is a useful imaging modality for examination of the globe in patients with Ocular trauma. It help the surgeon to plan medical or surgical treatment in advance.

REFERENCES

1. Colemon DJ, Lizzi, Fredenic L, Jack, Robert L. Ultrasonography of the eye and orbit. 1st edition Philadelphia, Lea and Febiger, 1977, P.VII.
2. Giglio, E. Diagnostic Ultrasound Application of A-Scan to the eye. In Sherman, J. Advanced diagnostic Procedures. Duncan,OKLA., Optometric Extension Foundation, 1976; . 23. Colemanet al, Ultrasonography, 1977; 79.
3. Bronson, N.R, Fisher, Y.L. et al. Ophthalmic Contact B-ScanUltrasonography for the Clinicion. Westport, Conn., International Publications. Inc, 1976; 27.
4. Knighton, Robert W, Blankenship, George W, Electrophysiological Evaluation of Eyes with Opaque media. International ophthalmology clinics. 1980; 20(1):1.2
5. Giglio E, Sherman J. Ophthalmic Ultrasound as a Diagnostic Tool. J Am Optom assoc, 1979; 50: 73-8.
6. Kaskalogu M. US Findings in Eyes with Traumatic Cataracts.Am J Ophthalmology. 1995; 9: 496.
7. Pavlin CJ, Harasiewics K, Sherar MD, et al: Clinical Use of Ultrasound Biomicroscopy. Ophthalmology 1991; 98: 287-95
8. JP Chugh, Susheel, M Verma**.** Role of Ultrasonography in Ocular Trauma. Radiol Imag. 2001; 11: 75-9.
9. Baig MSA, Zafar M, Anwar M. Major Ocular Trauma- An Analysis of 98 Admitted Cases. Pak J Ophthalmol. 2004; 20:148–52.
10. Fasih U, Sheikh A, Fehmi MS. Occupational Ocular Trauma(Causes, Management and Prevention). Pak J Ophthalmol.2004; 20: 65–73.
11. Butt NH. Visual outcome of penetrating injuries of anterior segment of eye. Pak J Ophthalmol. 1998; 14: 172–6.
12. Bakerrs S, Wilson MR, Flower CWG, et al. Demographic Factors in a Population Based Survey of Hospitalized Work Related Ocular Injuries. Am J Ophthalmol. 1996; 213–9.
13. Fong LP, Taouk Y. Role of eye protection in work related eye injuries. Anst – NZJ Ophthalmol. 1995; 23: 101–6..
14. Rai partab, shah, Syed Imtiaz Ali Shah, Alyscia M. Cheema, Javed Hassan Niazi, Shahid Jamal Sidiqui. Usefulness of B-Scan Ultrasonography in Ocular Trauma Pak J Ophthalmol 2007; 23(3):136-143