

B-scan Ultrasonography in Blast Related Posterior Segment Eye Injuries

Mumtaz Alam, Akbar Khan

Pak J Ophthalmol 2014, Vol. 30 No. 2

See end of article for authors affiliations

Correspondence to:
Mumtaz Alam
House No. 310, Street No. 5,
Sector E-4, Phase 7,
Hayatabad, Peshawar

Purpose: To study the role of B-scan ultrasonography in determining the extent of posterior segment pathology in blast related eye injuries.

Material and Methods: It was a descriptive case series conducted at Ophthalmology Department of Khyber Teaching Hospital Peshawar, from March 2010 to February 2012. Patients with blast related eye injuries and poor fundus view at presentation were included in the study. Patients with shattered globe in which corneal / scleral repair was not possible were excluded from the study. B-scan ultrasonography was done to know about the extent of posterior segment pathology. In those with open globe injury, B-scan was done after restoring the globe integrity.

Results: Ninety seven patients were included in the study. Ocular injury was unilateral in 66 patients (68.04%) and bilateral in 31 patients (31.95%). Of the 128 eyes involved, 83 eyes (64.84%) had open globe injury and 45 eyes (35.15%) had closed globe injury. B-scan was normal in 45 eyes (35.15%). Vitreous hemorrhage was the most common pathology seen in 54 eyes (42.18%), followed by retinal detachment which was seen in 27 eyes (21.09%) and intraocular foreign body in 19 (14.84%) eyes.

Conclusion: Bomb blast / mine blast can result in very severe eye injuries. In the presence of media opacities, B-scan ultrasonography is a very useful diagnostic tool for determining the extent of posterior segment pathologies in blast related eye injuries.

Mundt and Hughes were the first to use ultrasound in ophthalmology in 1956¹. They used an (Amplitude) scan for evaluation of intraocular tumor. Baum and Greenwood introduced the use of B (brightness) scan in 1958². Both A-scan and B-scan techniques are important for the diagnosis of ocular diseases³. Diagnostic ultrasound uses sound waves at frequencies above the range of human hearing (more than 20,000 Hz or 20 KHz)⁴.

B-scan ultrasonography is a safe, inexpensive, non-invasive, and accurate tool for evaluation of the posterior segment of eye when there is media opacity^{4,5}. It requires the use of high frequency transducer i.e. a 10 MHz is commonly used for posterior segment assessment. Nowadays very high-frequency systems (e.g. 50 MHz) can be used for the

assessment of anterior segment of the eye⁶.

Ultrasonography has more than 90% sensitivity and specificity in the diagnosis of ocular trauma cases⁷. It can detect vitreous hemorrhage, posterior vitreous detachment (PVD), hemorrhagic choroidal detachment, serous choroidal detachment, posteriorly dislocated lens, retinal detachment (RD), occult scleral rupture, vitreous incarceration and retained intraocular foreign body (IOFB)⁷.

Bomb blast / mine blast can cause a variety of potentially blinding posterior segment injuries, which may be difficult to detect without the use of B-scan ultrasonography. The purpose of our study was to study the role of B-scan ultrasonography in determining the extent of posterior segment pathology in blast related eye injuries.

MATERIAL AND METHODS

It was a descriptive case study conducted at Ophthalmology Department of Khyber Teaching Hospital Peshawar, from March 2010 to February 2012.

Inclusion criteria were unilateral or bilateral eye injury due to bomb blast / mine blast, both gender & all age groups and poor fundus view at presentation (due to corneal edema / opacity, hyphema, cataract or vitreous opacities).

Exclusion criteria were shattered globe in which corneal / scleral repair was not possible; Consecutive sampling technique was employed i.e. all the patients who met the inclusion criteria were included in the study.

Detailed history was taken and complete ocular examination was performed in all cases. B-scan ultrasonography was done with AB 5500+ A/B Scan (Sonomed, USA) to know about any posterior segment pathology. In eyes with open globe injury, B-scan was done after restoring the globe integrity.

RESULTS

Total number of patients was 97, including 93 males (95.87%) and 4 female (04.12%). Age of patients was ranging from 4 to 65 years with a mean of 23.70 years. Ocular injury was unilateral in 66 patients (68.04%) and bilateral in 31 patients (31.95%). Of the 128 eyes involved, 83 eyes (64.84%) had open globe injury and 45 eyes (35.15%) had closed globe injury (Table 1). B-scan was normal in 45 eyes (35.15%). In the remaining 83 eyes (64.84%) various abnormalities were detected on B-scan including vitreous hemorrhage, RD, PVD, choroidal detachment, IOFB, endophthalmitis and phthisis bulbi (Table 2). Vitreous hemorrhage was the most common pathology seen in 54 eyes (42.18%), followed by RD which was seen in 27 eyes (21.09%) and IOFB in 19 (14.84%) eyes.

Table 1: Laterality and type of eye injuries

	Open Globe	Closed Globe	Open Globe in One Eye and Closed Globe in other Eye	Total No. of Patients
Unilateral	47	19	-	66
Bilateral	16	11	04	31

Table 2: Abnormalities detected on B-scan ultrasonography

	No. of Eyes n (%)
Normal B-scan	45 (35.15)
Vitreous hemorrhage	54 (42.18)
Retinal detachment	27 (21.09)
Intraocular foreign body	19 (14.84)
Phthisis bulbi	06 (04.68)
Endophthalmitis	03 (02.34)
Posterior vitreous detachment	03 (02.34)
Choroidal detachment	01 (00.78)

DISCUSSION

Eye injury is a very important cause of visual impairment. Eye injuries make upto 10% of body injuries, despite the fact that eye makes only 0.27% of the body surface⁸. Approximately 2 million eye injuries occur in the United States annually, more than 40 thousand of these results in permanent visual loss⁹.

Ocular injuries predominantly occur in young males¹⁰ and can lead to blindness. Approximately 5% of blindness in the developing countries is the result of trauma¹¹. Ocular injuries can be divided into 2 main groups i.e. open globe and closed globe. Open globe eye injuries include rupture and laceration while closed globe eye injuries include contusion and lamellar laceration¹².

Bomb blasts are a common cause of severe eye injury among adult males¹³. They are becoming increasingly common in our country. Bomb blast/ mine blasts can cause a wide range of potentially blinding posterior segment injuries^{14,15}.

Direct visualization of the fundus is not possible in eyes with media opacities such as opaque corneal, hyphema, lenticular or vitreous opacities^{16,17}. B-scan can help us assess the posterior segment when the fundus cannot be visualized due to media opacities⁴.

In this study, 128 eyes with poor view of fundus due to corneal edema / opacity, hyphema, cataract and/or vitreous opacities were included. One or more posterior segment pathologies were detected in 83 eyes. Vitreous hemorrhage was the commonest pathology followed by RD and IOFB.

In one study, ultrasonography detected one or the other pathology in 21% of ocular trauma cases. Vitreous membrane was seen in 7 %, RD in 6%, vitreous hemorrhage in 4% & IOFB in 4% cases¹⁸. In another study, ultrasonography revealed RD in 17 (13%), vitreous haemorrhage in 14 (10.7%), macular edema in 14 (10.7%), endophthalmitis in 12 (9.2%), PVD in 7 (5.4%) and panophthalmitis in 1 (0.7%) eyes¹⁹. Djosevska ED, in his study, detected vitreous hemorrhage 20.9% eyes, RD in 4.4%, endophthalmitis in 3.3%, PVD in 3.8%, IOFB in 6.6% and choroidal detachment in 1.1% eyes on ultrasonography²⁰.

In our study posterior segment pathology was more frequently detected than the other studies. The reason for this being more severe eye injuries in blast victims as compared to eye injuries due to other causes. B scan is a very important diagnostic tool in such patients. The energy used in B-scan ultrasonography, does not damage the ocular tissues and it can be repeated (if needed), without any harmful effects²⁰.

CONCLUSION

B - scan ultrasonography is a very useful diagnostic tool for determining the extent of posterior segment pathologies in blast related eye injuries. In eyes with open globe injury, B - scan ultrasonography can be safely performed after restoring the globe integrity.

Author's Affiliation

Dr. Mumtaz Alam
Assistant Professor Ophthalmology Department,
Kuwait Teaching Hospital Peshawar

Dr. Akbar Khan
Eye Surgeon, Khyber Eye Foundation Peshawar

REFERENCES

- Mundt GH, Hughes W. Ultrasonics in ocular diagnosis. *Am J Ophthalmol* 1956; 41: 488-98.
- Baum G, Greenwood I. The application of ultrasonic locating techniques to ophthalmology, part I: reflective properties. *Am J Ophthalmol* 1958; 46: 319-29.
- Kanski JJ. Imaging Techniques. In: Kanski JJ Clinical Ophthalmology. A systemic approach 6th ed. Butterworth Heinemann Elsevier. 2007; 33-58.
- Rai P, Shah SIA, Cheema AM, Niazi JH, Sidiqui SJ. Usefulness of B-Scan ultrasonography in ocular trauma. *Pak J Ophthalmol*. 2007; 23: 136-43.
- Modrzejewska M. The use of ultrasonic techniques for the diagnosis of retinopathy of prematurity. *Ann Acad Med Stetin* 2006; 52: 83-8.
- Frederic L, Lizzi D, Coleman J. History of Ophthalmic Ultrasound. *J Ultrasound Med*. 2004; 23: 1255-66.
- Vyas J, Mahesh G. Ultrasonography in Ocular Trauma. *Kerala J Ophthalmol*. 2010; 22: 273-6.
- Belkin M. A historical prospective of ocular trauma. In: Miller D, Stegman R, (edi). Treatment of anterior segment ocular trauma. Montreal Medicopia. 1986. p. 7-21.
- McGwin G, Xie A, Owsley C. The rate of eye injury in the United States. *Arch Ophthalmol*. 2005; 123: 970-6.
- Tielsch JM, Parver LM. Determination of hospital charges and length of stay for ocular trauma. *Ophthalmology*. 1990; 97: 231-7.
- Thylefors B. Epidemiological pattern of ocular trauma. *Aust NZJ Ophthalmol*. 1991; 7: 15-8.
- Kuhn F, Morris R, Witherspoon CD, Mester V. The Birmingham Eye Trauma Terminology system (BETT). *J Fr Ophtalmol*. 2004; 27: 206-10.
- Newmann TL, Russo PA. Ocular sequelae of BB injuries to eye and surrounding adnexa. *J Am Optom Assoc*. 1998; 69: 583-90.
- Weichel ED, Colyer MH, Ludlow SE, Bower KS, Eiseman AS. Combat Ocular Trauma Visual Outcomes during Operations Iraqi and Enduring Freedom. *Ophthalmology*. 2008; 115: 2235-45.
- Rahman F, Rashid H, Naseem A. Ocular Sequelae of Blast Injuries: Experience at a Teaching Hospital. *Pak J Med Res* 2008; 47: 29-32.
- Blumenkantz MS, Byrne SF. Standardized echography (ultrasonography) for the detection and characterization of retinal detachment. *Ophthalmology*. 1982; 89: 821-31.
- Rabinowitz R, Yagev R, Shoham A and Lifshitz T. Comparison between clinical and ultrasound findings in patients with vitreous haemorrhage. *Eye* 2004; 18: 253-6.
- Bhatia IM, Panda A, Dayal Y. Role of ultrasonography in ocular trauma. *Indian J Ophthalmol*. 1983; 31: 495-8.
- Harshadbhai HT, Tyagi M, Jani S, Thakkar J, Sudhalkar A. Paediatric Ocular Trauma and Role of Echography in Evaluation of These Cases. AIOC PROCEEDINGS. Trauma Session. 2010; P. 694-6.
- Djosevska ED. Ultrasonography in Ocular Trauma. *Contributions Sec Med Sci*. 2013; 34: 105-12.