

Ocular Ultrasound for Evaluation of Eye Diseases among Hypertensive Patients with long term of Diabetes

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Abstract: Hypertension and diabetes are becoming increasingly common. Hypertension occurs more commonly in diabetics than in comparable nondiabetics. Point-of-Care Ultrasonography to accurately identify retinal detachment, vitreous hemorrhage, and vitreous detachment.^{(1), (2)}

The purpose of the current study was to evaluate the eye diseases among hypertensive patients with long term of diabetic using ocular ultrasound. A total of 184 patients attended eye department for either routine checkup or referred by physicians for ocular ultrasound (US) between 2016 and 2019, 106 males and 78 females, aged ranged between 37 and 77 years (mean age \pm SD, 63.7 ± 7.7 years) with history of both diabetic mellitus (DM) and hypertension (HTN) were enrolled in this prospective study. The inclusion criteria included; all hypertensive patients associated with long diabetes duration more than 10 years. A Nidek (Echoscan US – 4000) B- Scan ultrasonic unit with high frequency 10 MHZ transducer was used. A direct contact technique was applied. Initial examinations were done under high gain (80 dB to 100 dB) and low gain (60 dB to 70 dB). The current study found that the most affected age group was (50-59) years old involved 100 patients 97% of them showed abnormal sonographic findings followed by group (50-59) years old involved 52 patients. The most common disorder was retinal detachment which was detected in 64.1% (n = 118) followed by Vitreous Hemorrhage in 22.8% (n = 42). The study concluded that the incidence of eye diseases among hypertensive patients with long term of diabetes was high. Tentatively this results require supportive studies but no need for additional correlation imaging examinations unless for differential diagnosis.

Keywords: eye diseases, ocular ultrasound, diabetes hypertension.

Date of Submission: 12-03-2020

Date of Acceptance: 27-03-2020

I. Introduction

Hypertension and diabetes are becoming increasingly common. Hypertension occurs more commonly in diabetics than in comparable nondiabetics. Hypertension (defined as a blood pressure [BP] $\geq 140/90$ mmHg) affects 20 to 60% of patients with diabetes⁽¹⁾. Diabetes is a disease that occurs when your blood glucose, also called blood sugar, is too high. Blood glucose is your main source of energy and comes from the food you eat. Insulin, a hormone made by the pancreas, helps glucose from food get into your cells to be used for energy. Sometimes your body doesn't make enough—or any—insulin or doesn't use insulin well. Glucose then stays in your blood and doesn't reach your cells. Over time, having too much glucose in your blood can cause health problems. Although diabetes has no cure, you can take steps to manage your diabetes and stay healthy. If you have type 1 diabetes, your body does not make insulin. Your immune system attacks and destroys the cells in your pancreas that make insulin. Type 1 diabetes is usually diagnosed in children and young adults, although it can appear at any age. People with type 1 diabetes need to take insulin every day to stay alive. If you have type 2 diabetes, your body does not make or use insulin well. You can develop type 2 diabetes at any age, even during childhood. However, this type of diabetes occurs most often in middle-aged and older people. Type 2 is the most common type of diabetes.⁽³⁾ Blood pressure is the force exerted by circulating blood against the walls of the body's arteries, the major blood vessels in the body. Hypertension is when blood pressure is too high. Blood pressure is written as two numbers. The first (systolic) number represents the pressure in blood vessels when the heart contracts or beats. The second (diastolic) number represents the pressure in the vessels when the heart rests between beats. Hypertension is diagnosed if, when it is measured on two different days, the systolic blood pressure readings on both days is ≥ 140 mmHg and/or the diastolic blood pressure readings on both days is ≥ 90 mmHg.⁽⁴⁾ Ultrasonography is readily available, simple, cost effective, non ionizing, non invasive and a

reliable imaging modality for posterior segment ocular pathologies . It readily establishes the diagnosis in significant number of cases. It has a higher spatial and temporal resolution compared to both CT and MRI for the diagnosis of ocular pathologies. It superseded the accuracy of ophthalmoscopic diagnosis with significant difference (p- value < 0.0001). Even though for most orbital pathologies, it needs additional investigations (CT, MRI, histopathology) for confirming the diagnosis, ultrasound proves a useful imaging tool and correlates very well with the final diagnosis.⁽⁵⁾

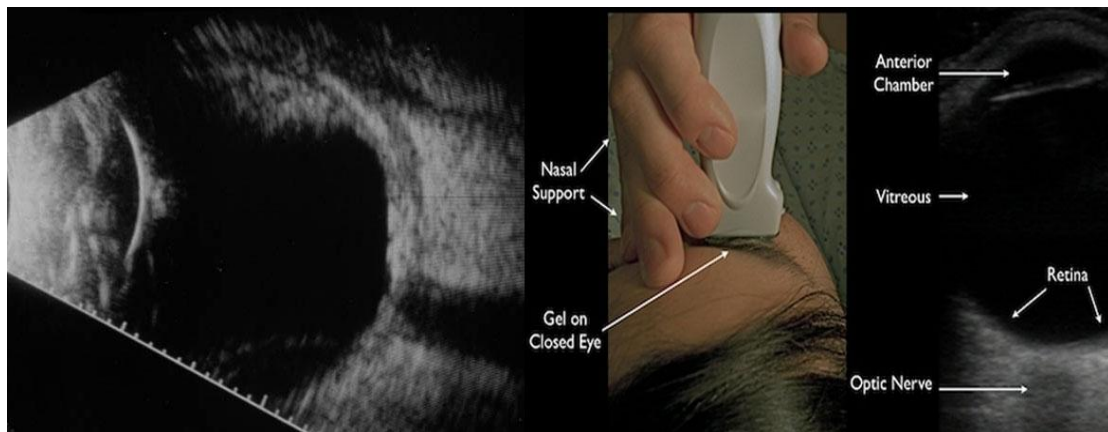


Figure 1-Ocular Imaging or Eye ultrasound or B-scan⁽⁶⁾

II. Material and Methods

Between 2016 and 2019, a total of 184 patients (106 males and 78 females), aged ranged between 30 and 79 years who presented for ocular US with history of both DM and HTN were enrolled in this prospective study. The including criteria included; all hypertensive patients associated with long diabetes duration more than 10 years. Children, diabetes only and adults with short duration of the disease were excluded. A Nidek (Echoscan US – 4000) B- Scan ultrasonic unit with high frequency 10 MHZ transducer was used (**Fig. 2**). A direct contact technique was applied (**Fig. 3-4**). Initial examinations were done under high gain (80 dB to 100 dB) and low gain (60 dB to 70 dB). Informed consent was obtained from all patients, and the study was reviewed and approved by an institutional review board.

Ultrasound evaluations of the eye and orbit were performed in the supine or sitting position. The probe was placed directly over the conjunctiva or cornea or placed over closed lids. The former has the advantage of reducing the sound attenuation caused by the lids; however it requires sterilization of the probe between procedures. A coupling solution was used to provide standoff and avoid attenuation caused by air. The analysis was performed with the Statistical Package for the Social Sciences (SPSS) version 20 for Windows; Microsoft.



Figure 2 Echoscan US – 4000⁽⁷⁾

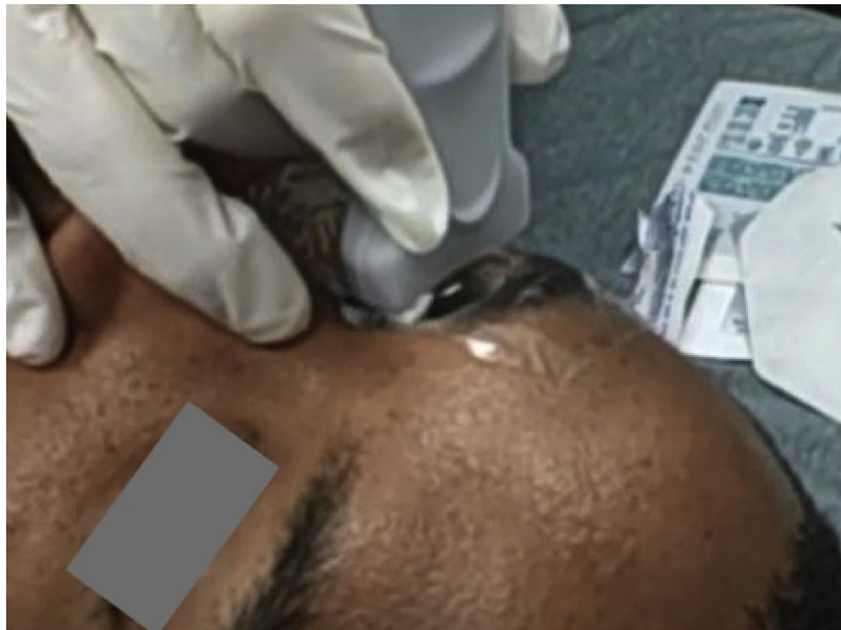


Figure 3.Ocular B-scan with a transverse probe position. The probe face is coated in ultrasound gel and positioned on the opposite conjunctival surface parallel to the limbus.



Figure 4.Ocular B-scan with a longitudinal probe position. The probe face is rotated so that it is perpendicular to the limbus, or to the area of interest.



Figure 5 Left eye transverse ocular US for HTN /DM Patient 66 year old male shows retinal detachment + vitreous change.



Figure 6 Right eye transverse ocular US image for HTN /DM Patient 61 year old female shows retinal detachment

III. Result

Table 1 Sex

	Frequency	Percent	Valid Percent	Cumulative Percent
Male	106	57.6	57.6	57.6
Valid Female	78	42.4	42.4	100.0
Total	184	100.0	100.0	

Table 2 Age Group

	Frequency	Percent	Valid Percent	Cumulative Percent
(30-39) Years	8	4.3	4.3	4.3
(40-49) Years	13	7.1	7.1	11.4
(50-59) Years	52	28.3	28.3	39.7
(60-69) Years	100	54.3	54.3	94.0
(70-79) Years	11	6.0	6.0	100.0
Total	184	100.0	100.0	

Table 3 Ultrasound Findings

	Frequency	Percent	Valid Percent	Cumulative Percent
Retinal Detachment	118	64.1	64.1	64.1
Vitreous Changes	4	2.2	2.2	66.3
Vitreous Hemorrhage	42	22.8	22.8	89.1
Valid Retinal detachment + Vitreous changes	3	1.6	1.6	90.8
Normal	5	2.7	2.7	93.5
Retinal Detachment + Vitreous Hemorrhage	12	6.5	6.5	100.0
Total	184	100.0	100.0	

Table 4 Normal vs abnormal

	Frequency	Percent	Valid Percent	Cumulative Percent
Normal	5	2.7	2.7	2.7
Valid abnormal	179	97.3	97.3	100.0
Total	184	100.0	100.0	

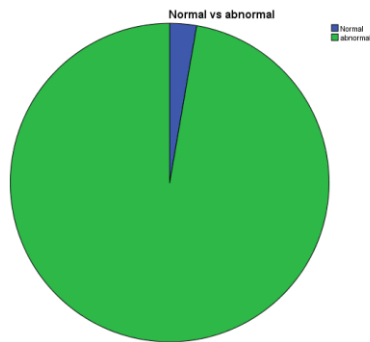


Figure 7 Normal vs Abnormal

Table 5 Crosstab of Age Group & Normal vs Abnormal

	Normal vs abnormal		Total
	Normal	abnormal	
(30-39) Years	1	7	8
(40-49) Years	1	12	13
(50-59) Years	0	52	52
(60-69) Years	3	97	100
(70-79) Years	0	11	11
Total	5	179	184

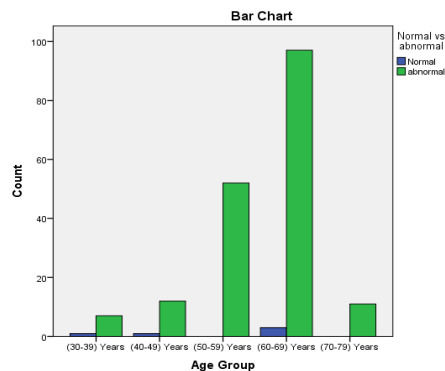


Figure 8. Age group* Normal vs Abnormal

IV. Discussion

Diabetes Mellitus, particularly the Type 2 is a major health problem and of great concern worldwide and so is the Hypertension, the prevalence of which is rising and both combined together may lead to economical blindness if not treated adequately and in time .Worldwide, the prevalence of moderate to severe visual impairment and blindness is 285 million, with 65% of visually impaired and 82% of all blind people being 50 years and older.(8) the current study include 184 hypertensive patients with long term of DM the rest of them (179) (97.5%) patients were affected by variable eye diseases Table 4, this result agree with study done by Abdalla et al conclude that the magnitude of chronic diseases such as diabetes, hypertension, obesity and dyslipidemia seems to be higher in patients with dry eye syndrome compared to the population (9). According to age the first group (30-39) years included 8 patients 7 out of them were affected the 2nd group (40-49) years old contained 13 patient, 12 of them were affected. The 3rd group (50-59) years old involved 52 patients all of them were affected. The 4rd group (50-59) years old involved 100 patients 97% of them showed abnormal sonographic findings. The last group (60-69) years old contained 11 patients all of them were showed variable eye diseases Table 5. There is direct correlation with age group these findings support a study done by ArjaLaitinen, et al which concluded that the high prevalence of major eye diseases mainly age-related eye diseases, together with increasing life expectancy, mean that continuous efforts are needed to identify and treat eye diseases in order to maintain patients' quality of life and to alleviate the social and economic burden of serious eye diseases (10). The most frequent disease that found by the current study was the retinal detachment with represent (64.1%) (table 3), which these results agree with Lin et al whom concluded that higher risk of diabetic retinopathy is associated with longer duration of diabetes and insulin therapy.(11)A study done by Naha M. et al showed that different ophthalmic conditions were discovered for the first time at the general checkup clinic. Certain conditions were more common than others in certain countries. Sudanese patients showed a higher percentage of glaucoma (13.3%) and ocular hypertension (8.3%). (12)

V. Conclusion

In conclusion, the study evaluated the hypertensive patients with long term of diabetes (more than 10 years) by using ocular ultrasonography, which detected wide range of eye diseases. The incidence of eye diseases among hypertensive patients with long term of diabetes was high. Tentatively this results require supportive studies but no need for additional correlation imaging examinations unless for differential diagnosis

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Safaa Bashir, et al. "Ocular Ultrasound for Evaluation of Eye Diseases among Hypertensive Patients with long term of Diabetes." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 19(3), 2020, pp. 23-28.