

Prevalence of Proliferative Diabetic Retinopathy in the Hospital Especializado de la Salud Visual Mexiquense, Diagnosed by B Mode Ultrasonography

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Abstract

Background: In Mexico the second cause of non-reversible blindness is Diabetic Retinopathy. Diabetes is considered to be a pandemic in Mexico, especially in patients between 40 and 90 years.

In Mexico 71% of the Diabetic patients have Diabetic Retinopathy (with a greater prevalence in patients with type 1 Diabetes) and 37% of this patients have the proliferative form of the disease.

Objective: To determine the prevalence and the features of Proliferative Diabetic Retinopathy (PDM) in the Ultrasound department in the Hospital Especializado de la Salud Visual Mexiquense (HESVM).

Methods: Data were drawn from the archives of the (HESVM) from all the patients who came to the ultrasound department from February 2016 to December 2018. Ultrasonography of 984 eyes were reviewed to look for images compatible with PDR. The discoveries were classified in vitreous hemorrhage (VH), subhyaloid hemorrhage (SHH), thickened Hyaloid (TH), fibrous proliferation (PF), retinal tractions (RT), tractional retinal detachment (TRD), subretinal hemorrhage (SRH), posterior hyphema (PH), macular thickening (ME), choroidal detachment (DC) and vitreous blood clot (VBC), Non diabetic B-scans (NDBS).

Result: From the 984 case files reviewed 230 (23.3%) had VH, 179 (18.2%) had SHH, 83 (8.4%) had TH, 25 (2.54%) had PF, 26 (2.64%) had RT, 97 (9.86%) TRD, 8 (0.81%) had SRH, 9 (0.91%) had PH, 5 (0.51%) had MT, 4 (0.41%) DC and 28 (2.85%) had VBC, the rest were (NDBS) 290 (29.47%) with no ultrasonographic images of PDM.

Conclusion: We can conclude from the studied population that at least 70% had ultrasonography images compatible with PDR, and almost 10% had TRD, which is an important number of patients with non-reversible blindness caused by PDR.

Keywords: *Diabetic Retinopathy; Proliferative Diabetic Retinopathy; Ultrasound; B Scan; Eye Ultrasound; Vitreous Hemorrhage*

Introduction

In Mexico the second cause of non-reversible blindness is Diabetic Retinopathy. Diabetes is considered a national pandemic, especially in patients between 40 and 90 years.

Seventy one (71%) percent of the diabetic patients have Diabetic Retinopathy until the year 2009 (with a greater prevalence in patients with type 1 Diabetes) and 37% of this patients have the proliferative form of the disease [1]. B-scan ultrasonography creates an image of the eye by using sound waves transmitted at a high frequency from a transducer to the target tissue, which then return to the transducer at varying times and amplitudes. These signals are then interpreted and summed to construct a two-dimensional image of the eye, B-scan ultrasonography is most useful in patients with vitreous hemorrhage or other media opacity, where the retina cannot be

visualized directly on ophthalmic examination. B-scan ultrasonography can demonstrate if a retinal detachment is present and can show other retinal pathology such as a vitreous hemorrhage or posterior vitreous detachment [2]. Patients that come to the hospital because they have an important diminution of vision and need a B scan.

Purpose of the Study

To know the prevalence and the features of Proliferative Diabetic Retinopathy (PDR) in the Ultrasound department in the Hospital Especializado de la Salud Visual Mexiquense (HESVM).

Materials and Methods

This study was possible thanks to the information drawn from the data base of the Imagenology Department of the Hospital Especializado de la Salud Visual Mexiquense in Naucalpan State of Mexico, from all patients who had B scans between February 2016 and December 2018. This B Scans were made with a VuPad™, (Sonomed Escalon, Lake Success, NY) with a 12 MHz probe by an ophthalmologist with ultrasound training, the B scan were indicated when opacity media made impossible to explore the retina with optic instruments, first a tetracaine drop was installed in the eye and 2% methylcellulose was put in the probe, then an axial scan was made, with longitudinal and transverse scan in III, VI, IX and XII positions. The images were analyzed by the same ophthalmologist who made the studies, and he also made the report, which at least included, an axial scan and macular scan, but the report could include up to 10 images depending of the findings of the B scan. Then reports were stored in a hard drive with the diagnosis and findings for latter analysis. Then the images compatible with proliferative diabetic retinopathy (PDR) were extracted and count, and they were divided according a specific PDR finding, which included: vitreous hemorrhage (VH), subhyaloid hemorrhage (SHH), thickened hyaloid (TH), fibrous proliferation (FP), retinal tractions (RT), tractional retinal detachment (TRD), subretinal hemorrhage (SRH), posterior hypema (PH), macular thickening (MT), choroidal detachment (DC), vitreous blood clot (VBC) and Non diabetic B-scans (NDBS) which refer to features different than the previously mention or features no related to DRP, for example, it could be a dense cataract rhegmatogenous retina detachment.

All of these findings were reported independently regardless if more than one feature was present in one eye. If one eye had HV with TRD, both findings were counted separately.

Results

This is an observational, descriptive and retrospective study in which 984 B scans, from 1829 patients were analyzed, this group of patients came to the imagenology department from February 2016 to December 2018, with age range from 23 to 88 (mean 55) years. The findings are enumerated in table 1 and graph 1.

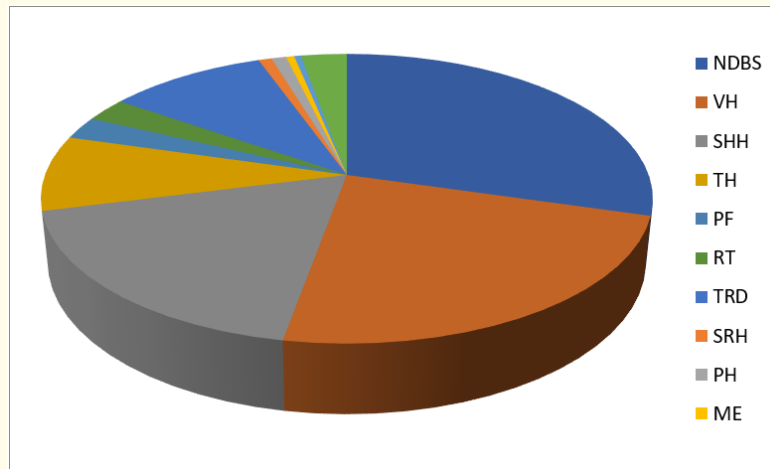
The most frequent finding in this group were Non diabetic B-scans (Figure 1) (NDBS) in 290 patients (29.47%), following by vitreous hemorrhage (Figure 2) (VH) 230 (23.37%), subhyaloid hemorrhage (Figure 3) (SHH) 179 (18.19%), tractional retinal detachment (Figure 4) (TDR) 97 (9.86%), thickened Hyaloid (Figure 5) 83 (8.43%), vitreous blood clot 28 (Figure 6) (VBC) (2.85%), retinal tractions (Figure 7) (RT) (without detachments) 26 (2.64%), fibrous proliferation (Figure 7) (FP) 25 (2.54%), posterior hypphema (Figure 8) (PI) 9 (0.91%), Sub retinal hemorrhage (Figure 9) (SRH) 8 (0.81%), macular thickening (Figure 10) (MT) 5 (0.51%), choroidal detachment (Figure 11) (CD) 4 (0.41%).

Discussion

Diabetes mellitus is a worldwide health problem with high priority in Mexico, in 2013 9.17% of all adults with 20 years and older, had been diagnosed with diabetes, which is equivalent to 6.4 million people, 47.6% of this number (3 million people) reported a decrease in their visual acuity and 13.9% (889,000) had Diabetic Retinopathy [3], this report also studied Mexican population but with no specific

	NDBS	VH	SHH	TRD	TH	VBC	RT	FP	PH	SRH	MT	CD	Total
Number of Patients	290	230	179	97	83	28	26	25	9	8	5	4	984
%	29.47	23.37	18.19	9.86	8.43	2.85	2.64	2.54	0.91	0.81	0.51	0.41	100

Table 1: Number and percentage of the findings.



Graph 1

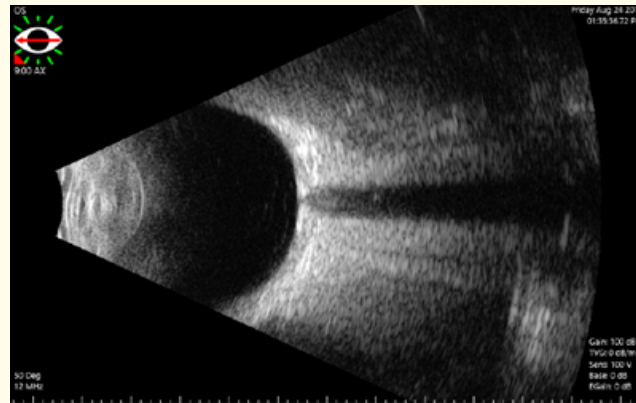


Figure 1: In this B scan with a dense cataract, with no other features of PDR.

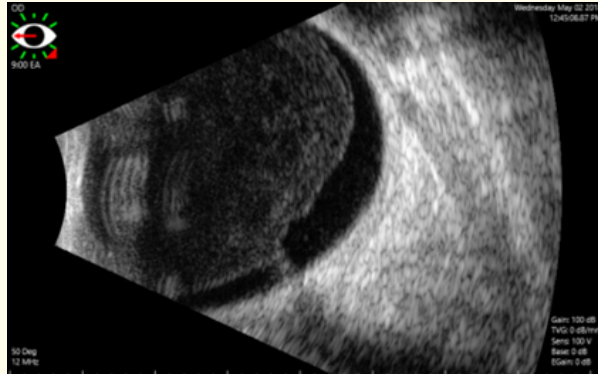


Figure 2: In this B scan we can observe an increase in brightness in the hyaloid, secondary to vitreous hemorrhage, with an anechoic subhyaloid space.

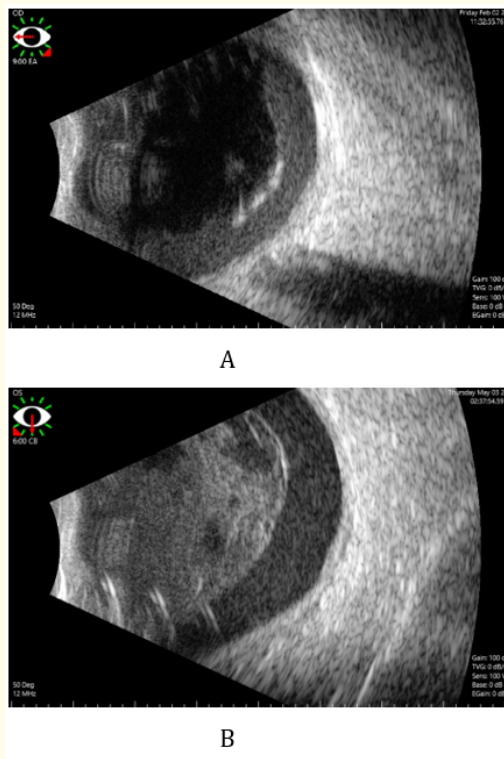


Figure 3: In this images an increase in brightness can be seen in the subhyaloid space corresponding with subhyaloid hemorrhage, in image A there is no blood in the vitreous body, and in image B we can see a vitreous hemorrhage, and a subhyaloid hemorrhage.

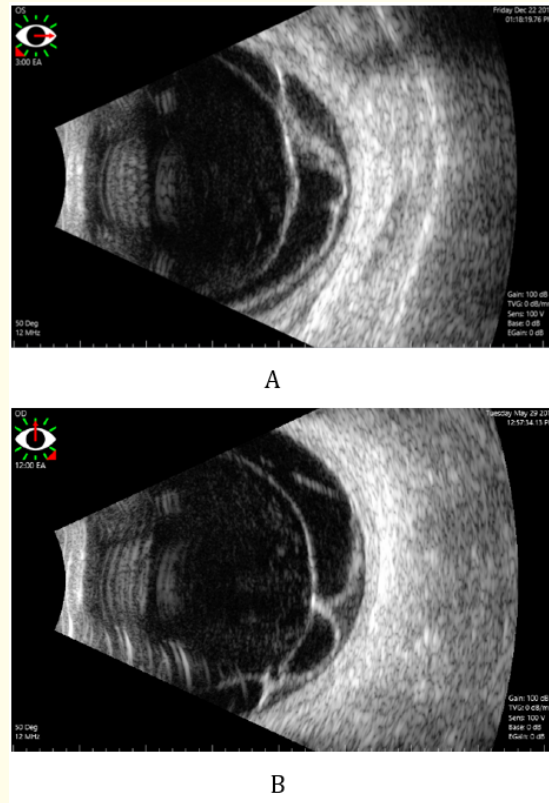


Figure 4: In both images can be seen how a thickened hyaloid is pulling the retina, this is typical image of tractional vitreous detachment, also in both cases a sub retinal hemorrhage can be seen.

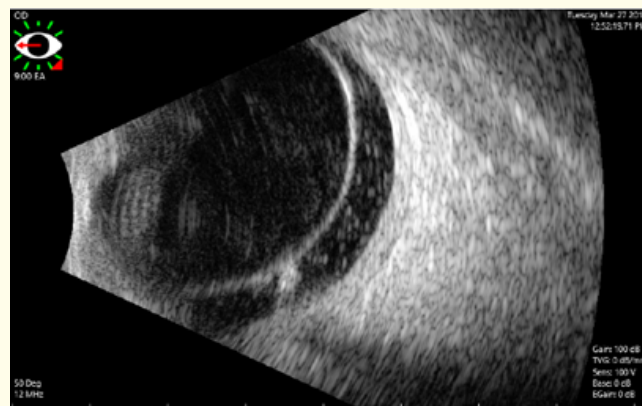


Figure 5: In this B scan a thickening of the hyaloid is seen, with a subhyaloid hemorrhage.

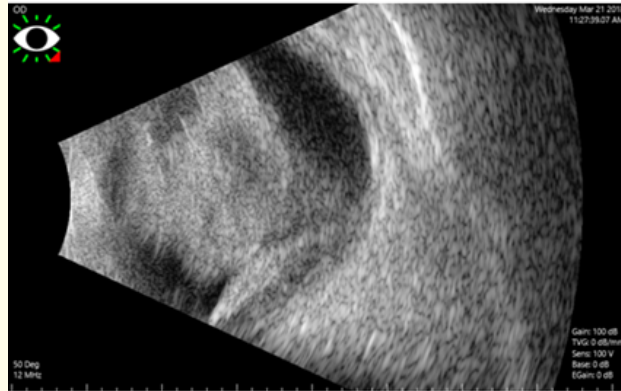


Figure 6: This increase of brightness is caused by a blood clot in the vitreous body, normally we can see it with little to medium movement, also an inferior hemorrhagic choroidal detachment can be seen.

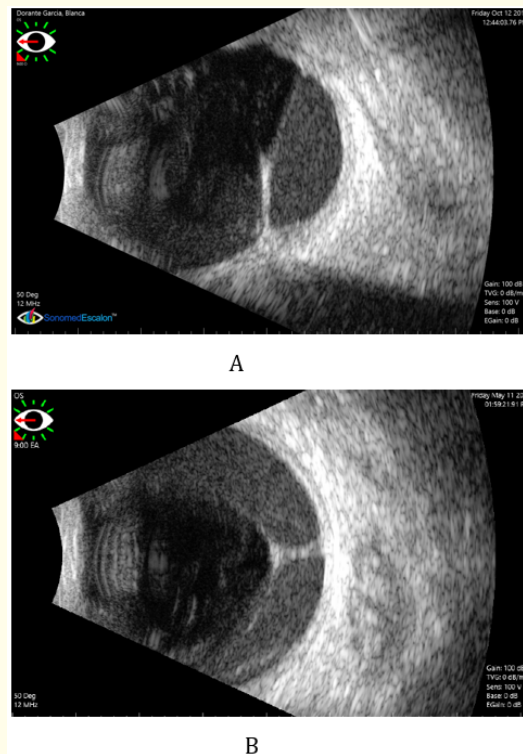


Figure 7: B scan with high brightness images forming pseudomembranes, with little movement, corresponding with fibrous proliferation, and punctiform moving echoes corresponding to subhyaloid hemorrhages, in image A the proliferation is pulling the retina without detachment (retinal traction).

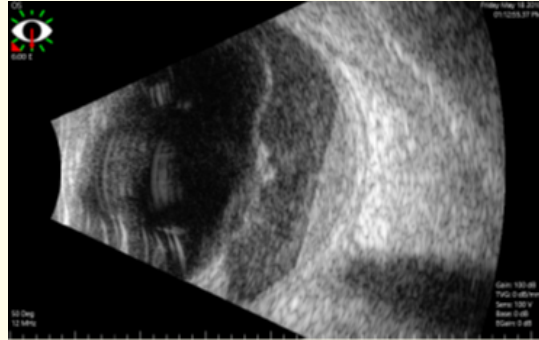


Figure 8: B scan with a subhyaloid hemorrhage with 2 different brightness, the brighter one with the flat edge correspond to liquid blood or posterior hyphema, its appearance and position will change with eye movement.

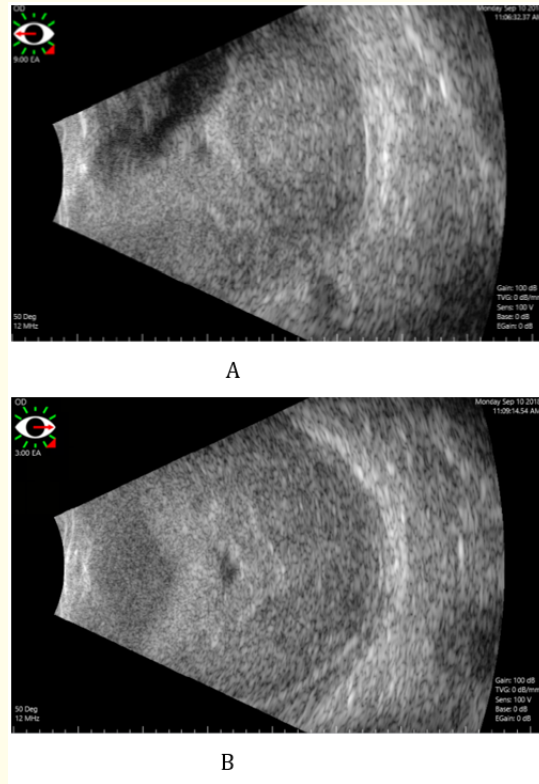


Figure 9: This B scans shows multiple, mobile and shining echoes, with a central attenuation, image A is a longitudinal B scan in M III with a linear attenuation (less bright part of the images) in the center, and the B image is a transverse III image showing a round attenuation in the middle of the shining echoes. This B scan correspond to a negative retina detachment which can be seen in cases of massive subretinal hemorrhage, due to the hemorrhage brightness the retina shows an attenuation making the blood brighter than the retina.

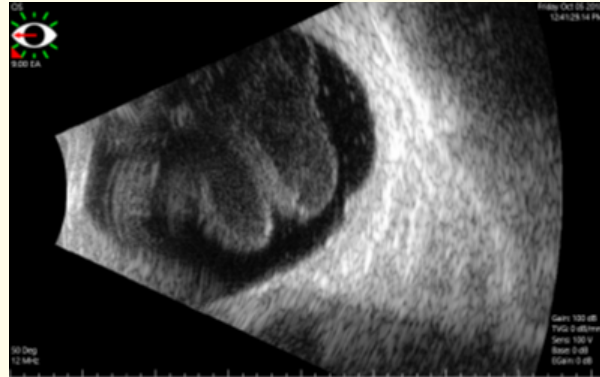


Figure 10: B scan with a round bright macular echo (L III) corresponding with macular thickening most likely secondary to macular edema.

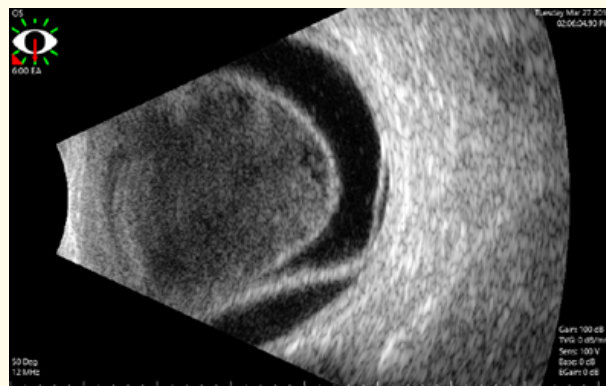


Figure 11: B Scan with mobile, solid vitreous hemorrhage with an echo lucent subretinal space, also a thin non mobile pseudomembrane echo can be seen corresponding to retinal detachment, and the inferior thicker pseudomembrane dome shape echo, correspond to choroidal detachment.

aim to detect diabetic retinopathy, which can explain the difference in number with the Prado A,S study. Seven years later this numbers without any doubt have increased.

México has a higher prevalence of DPR comparing with studies in other places, like the number reported in Los Angeles Latino study, the author report 6.1% of patients having PDR [4], or studies in the middle east were PDR can be seen in 5.2% among patients with diabetic retinopathy [5]. In Poland Diabetic retinopathy was found in 25.48% of patients, with 1.59% having DPR [6], a lower number than in Mexico. An exception must be mentioned, in Ethiopia the prevalence of diabetic retinopathy is reported to be 18.9% and 24.6% had the proliferative type [7], a high number but not as high as Mexico.

Rabinowitz R., *et al.* in his study reported that 35% of vitreous hemorrhage was caused by proliferative diabetic retinopathy and in 33 eyes (31%) the reason was ocular trauma [8]. We found a lower incidence of vitreous hemorrhage secondary to diabetic retinopathy and only 2 patients with vitreous hemorrhage secondary to trauma. Mohamed IE., *et al.* [9] also looked for specific causes of visual loss in patients with diabetic retinopathy, in that sense his study is the most similar work to the present report. He found a 40% of vitreous hemorrhage and a 32 % of total TRD, both numbers are much higher than our results, as his number for asteroid hyalosis which he found in the 14% of his patients, while in this study that finding was lower than 1%.

It is important to detect diabetes as possible, as commented by Klein R., *et al.* [10], more recently diagnosed diabetes was associated with lower prevalence of loss of vision. This is why is so important to make a B scan as soon as possible, in cases where the vitreous hemorrhage is suspected. To detect PDR and to document its progression, not only will improve the patient's vision, it also can save lives, as Tryniszewski W., *et al.* [11] reports, assessment of the progression of diabetic retinopathy in patients with type 2 DM may be an indicator of heart muscle perfusion disturbance.

The study focus was on the ultrasonographic findings for proliferative diabetic retinopathy, we decide to focus on PDR because all the patients that came to the Image department of the HESVM for a B Scan have already opaque eye media, like dense cataract or vitreous hemorrhage, but many of this patients refer they didn't know they were diabetic, and despite the NDBS were the more frequent as a sole finding, the other 70% had ultrasonographic features of PDR.

Up to 9.86% of patients coming for a B scan had already TRD, a lot more than the 2.54% of patients with FP. Separately the most frequent finding was dense cataract, but if we put together all other features, PDR is by far was the most common finding, meaning that in Mexico, specifically in Mexico City and in Naucalpan (Estado de México) there is a 70% chance that if a patient, diabetic or not, needs a B scan, this will show at least a feature of PDR. More studies like this are needed to validate this findings.

Conclusion

In summary, if a patient in Mexico City or State of Mexico need an eye B scan, there is a 70% chance it will show a PDR finding, and a 10% chance TRD.

Statement of Informed Consent

Because this study involved analysis of an existing database that had no patient identifiers, no informed consent was required.

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Declaration of Conflicting Interests

The author declares he has no conflict of interest.

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