USE OF NON-MYDRIATIC RETINOGRAPHY TO DETERMINE THE PREVALENCE OF DIABETIC RETINOPATHY IN DIABETIC PATIENTS

ESTUDIO DE PREVALENCIA DE RETINOPATÍA DIABÉTICA EN PACIENTES DIABÉTICOS MEDIANTE RETINÓGRAFO NO MIDRIÁTICO

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ABSTRACT

Objectives: To establish the prevalence and severity of diabetic retinopathy (DR) in a sample of patients from «Health Area 3» in the Community of Madrid using non-mydriatic retinography and telemedicine.

Methods: All patients who had their ocular fundus examined due to one of the following conditions were included in the sample: type 1 diabetes (DM1), type 2 non-insulin-dependant diabetes (DM2NID), and type 2 insulin-dependant diabetes (DM2ID). In all cases, 3-field retinographies were taken of both eyes to be evaluated for the presence of DR, and its severity, by an ophthalmologist at the hospital.

Results: No DR was observed in 79% of the patients examined, 9% had a mild non-proliferative DR, 9% had a moderate non-proliferative DR, and 1% had a severe non-proliferative DR. The estimated prevalence of DR in «Health Area 3» of the Community of Madrid was thus 21%. In 12% of the examinations the retinographies were considered «low quality», thus requiring a second evaluation at hospital.

RESUMEN

Objetivo: Conocer la prevalencia y gravedad de la retinopatía diabética (RD) en una muestra poblacional de pacientes diabéticos del área sanitaria 3 mediante el empleo de cámaras no midriáticas (CNM) y telemedicina.

Métodos: Se incluyeron todos los pacientes que acudieron a revisión de fondo de ojo en el área sanitaria 3 de la comunidad de Madrid por presentar diabetes mellitus tipo 1 (DM1), diabetes mellitus tipo no insulinodependientes (DM2NID) y diabetes tipo 2 en tratamiento con insulina (DM2ID). Se realizaron retinografías en tres campos de los dos ojos, que fueron valoradas por un oftalmólogo en el hospital. Se valoró la presencia de retinopatía diabética y su gravedad.

Resultados: En el 79% de los casos la exploración no mostró signos de RD, en el 9% RD no proliferativa leve, en el 9% RD no proliferante moderada, en el 1% RD no proliferante severa. Esto arroja una prevalencia aproximada del 21% de RD en la población diabética del área 3. El 12% de las retinografías fueron no valorables, necesitando exploración por un oftalmólogo.
CONCLUSIONS: The use of non-mydriatic retinography and telemedicine is an adequate method for the screening of DR among the diabetic population (Arch Soc Esp Oftalmol 2009; 84: 231-236).

KEY WORDS: Diabetic retinopathy, diabetes mellitus, non-mydriatic camera, population study, neovascularization.

CONCLUSIONES: El uso de cámaras no midriáticas y telemedicina es un método adecuado para el cribado de la RD que en la población afecta de diabetes mellitus.

PALABRAS CLAVE: Retinopatía diabética, Diabetes mellitus, cámara no midriática, estudio poblacional, neovascularización.

INTRODUCTION

Diabetes is the most frequent cause of legal blindness in developed countries in the population group between 20 and 64 years of age (1). Early detection of patients with diabetic retinopathy (DR) susceptible to treatment would allow for a reduction of the prevalence of severe ocular complications and severe visual loss as well as cost savings (2). Accordingly, diabetic patients are recommended to undergo regular ophthalmological assessments. The prevalence of diabetes mellitus (DM) in our environment involves a high cost in resources for the routine visit of these patients. If the screening of a diabetic pathology is made outside the ophthalmological practice, its use could be optimized for more severe pathologies. According to the «Early Treatment Diabetic Retinopathy Study» (ETDRS), the gold standard for DR screening is the use of seven eye fundus photographs, which exhibited greater sensitivity and specificity than a clinical assessment with indirect ophthalmoscopy (3,4).

In recent years the usefulness of non-mydriatic cameras (NMC) has been evaluated for this purpose, exhibiting the same efficiency as ETDRS (5-12). EURODIAB IDDM recommend the use of three flat 45° retinographs (13).

At this time there is no study focusing on the prevalence of DR in an entire health area of Spain. Accordingly, the actual prevalence of this disease in our country is not known. This work is a pilot study which aims at defining the prevalence of DR in the diabetic population controlled by the Health Service of Madrid in Health Area #3 of the region. According to the census of the community of Madrid, the population of Area Three in 2008 was of 379.000 inhabitants, which means that the number of diabetics can be estimated to be around 19.000.

SUBJECTS, MATERIAL AND METHODS

This is a prospective and observational study comprising all the patients referred by their primary health care physician and the endocrinologist for an eye fundus assessment in a consecutive manner due to diabetes mellitus between October 1, 2006 and March 30, 2007, totaling 1393 patients. The patients visited one of the two practices in the Peripheral Specialty Centers of Area 3, where three 45° retinographies were made for each ocular fundus following the Joslin Vision Network protocol (12), i.e., one focused on the posterior pole and two more focused in the superior and nasal medium periphery. In addition and for security reasons as well as for patient identification, a fourth photograph was taken of the iris of each eye. The photographs and retinal graphs were made with non-mydriatic retinographs of the TRC-NW6S type made by TOPCON, connected by Internet to the Príncipe de Asturias University Hospital (PAUH).

After the optometrist took the retinographies, an ophthalmologist of the retina and vitreous unit of the PAUH assessed the ocular fundus images to verify whether the retinographies had sufficient quality and assessed the condition of the patients retina. The ophthalmologist filled in a database form in the HP-Doctor application version 2.17.0.01 (Hewlett-Packard Español SA), which produces clinical reports (sent via e-mail to the physician who requested the assessment) and allows the exploration of the stored data for subsequent statistical analysis.

When the ophthalmologist identified an ophthalmological pathology which required specialized exploration, the patient was directly referred to the hospital for the appropriate supplementary diagnostic tests. If the retinographies could not be assessed,
the patient was referred for funduscopic exploration and the results were introduced in the computer application.

The diabetic retinopathy data were obtained following the classification made by the American Academy of Ophthalmology (14) which divides diabetic retinopathy in: not apparent DR, slight non-proliferative SNPDR, moderate NPDR, severe SNPDR and proliferative PDR. In turn, it divides macular edema (ME) in slight, moderate and severe.

The data were introduced in a spreadsheet. The statistical study was made utilizing the SPSS programme, version 11.5 (SPSS inc, Chicago, Illinois, USA).

RESULTS

1,393 diabetic patients were given an appointment for taking ocular fundus photographs by means of a non-midriatic camera. Of these, 1,189 patients fulfilled the appointment and we obtained 1,048 patients with complete filled in computer forms. 573 males and 475 females were included. The distribution of the patients according to the type of DM they exhibited is as shown in figure 1.

Of all the photography studies, 121 (10.09%) were defined as «faulty for assessment» or their images were not recorded, but the findings of the ocular fundus exploration were introduced in the database after a conventional funduscopic exploration.

Figure 2 shows the distribution of patients based on the existence of DR and the severity thereof. 220 patients exhibited some degree of diabetic retinopathy (21%). Of these patients divided according to the type of DM (fig. 3), 26.12% of patients with DM type 1 (DM1) had some degree of retinopathy. In addition, 40.09% of patients with DM type 2 on insulin treatment (DM2ID) and 14.49% of patients with DM Type II without insulin treatment (DM2NID).

Figure 4 shows the severity of DR according to the type of DM.

A comparative study was made to observe the behavior of DR in relation to the time of evolution of DM (fig. 5). 41.38% of diabetic patients with an evolution exceeding 15 years had some degree of
DR against 15.59% of patients who had less than 10 years of evolution.

When the severity of DR according to the time of evolution of DM, clear differences were observed mainly in the group of patients with moderate DR (the group with the highest number of patients) as can be seen in figure 6.

In addition, the frequency of ME was compared based on the DM type. Thus, any degree of ME existed in 7.58% of DM1, 11.74% of DM2ID and 2.46% of DM2NID.

A comparative analysis was performed to observe the behavior of ME vis-à-vis the evolution time of DM (fig. 7).

No statistically significant differences were found when studying the prevalence of DM types per gender.

**DISCUSSION**

In this paper we present the results of the prevalence study of 1,393 diabetic patients. This is one of the largest populations studied in Spain carried out with similar methodologies.

The inclusion of patients in this study was based on consecutive patients referred by all primary health care physicians and endocrinologists of Health Area 3. All the diabetic patients that attended said practices were evaluated. The optimum situation for this kind of study is to have an evaluation of the entire population, avoiding any selection bias. Our study aimed at reaching this optimum situation, and we believe that with this selection system said aim can be achieved.

Other studies made in Spain for establishing the prevalence of DR have utilized samples which are not representative of the general population, such as the study made by López et al in Valladolid (15) that studied the rural population or the one by Santos et al (16) that studied the urban population of the city of Badajoz. Other studies sought to obtain a representative sample of the population (17-22) but none of these secured the participation of all the centers in charge of following up the diabetic population. Instead, diabetes control centers were selected according to subjective criteria about being representative of the diabetic population and the sample size was calculated on the basis of a prior estimate of DR prevalence (18,20). In our case, the participation of all the primary health care physicians and endocrinologists of the health area allowed us to ensure that the sample is truly representative of the population.

The prevalence of diabetic retinopathy in this study reached 21%, a lower percentage than the rest.
of studies made in Spain with the exception of the López et al study (15). The difference can be due to actual differences in the prevalence in regions with different control of DM or to differences between the patient inclusion systems.

On the other hand, the classification system we utilized is the International Clinical Classification for Diabetic Retinopathy recommended by AAO (14) in contrast with other studies that utilized the modified ETDRS classification system. Thus, the different criteria could explain the variations in prevalence rates found in the DR severity percentages and render our data not comparable with those of other studies.

In any case, this low prevalence implies a good control of diabetic pathology in Health Area 3 of the community of Madrid. This is particularly significant in DM1 patients. Other studies have found differences between the DR prevalence rates, depending on populations and DM control quality (16).

The prevalence of ME in our study is of 4.68%, which falls within the range described by other authors (15-20).

One of the aims of this pilot study was to determine the prevalence of DR in a sample of diabetic patients referred for ocular fundus examination by the primary health care physician or the endocrinologist. With this method we are very close to a population study and in the future we aim at covering the entire diabetic population monitored by the Madrid Health System who live in Health Area 3 of the region. The population sample utilized in this study is sufficiently large to allow a correct estimate of the population affected by DR. The system used has proven to be effective (5-12). The combination of new technologies such as MNC and telemedicine have allowed us to assess a larger number of patients in a short time and optimizing resources as well as carrying out the assessments in a comfortable manner for the patient and the ophthalmologist.

REFERENCES

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