AGREEMENT AMONG OPHTHALMOLOGISTS AND PRIMARY CARE PHYSICIANS IN THE EVALUATION OF RETINOGRAPHIES OF DIABETIC PATIENTS

CONCORDANCIA EN EL ESTUDIO DE RETINOGRAFÍAS EN DIABÉTICOS: OFTALMÓLOGOS VS MÉDICOS DE FAMILIA

ANDONEGUI J1, BERÁSTEGUI L1, SERRANO L2, EGUZKIZA A3, GAMINDE I4, ALISEDA D5

ABSTRACT

Purpose: To assess the extent of agreement in the evaluation of non-mydriatic retinographies of diabetic patients among ophthalmologists and a group of primary care physicians with previous training.

Methods: The study was divided in two phases. In the first phase, the four participants were instructed in the interpretation of retinographies. The second phase involved the evaluation of 1000 images of 200 patients, 100 without retinopathy and 100 with signs of diabetic retinopathy. The four participants had to decide if the images did or did not show evidence of diabetic retinopathy. Kappa index was used to assess the extent of agreement. A percentage disagreement of 15% with a precision of 5% (±5%) with a confidence level of 95% was considered adequate.

Results: The percentage of coincident diagnoses among ophthalmologists and primary care physicians was between 89 and 97.5%. With respect to the assessment of the agreement, the kappa index

RESUMEN

Objetivo: Determinar la concordancia en la interpretación de retinografías no midriáticas de pacientes diabéticos entre oftalmólogos y un grupo de médicos de atención primaria previamente sometidos a un proceso de adiestramiento.

Métodos: El estudio fue dividido en dos fases. En la primera se adiestró a los participantes en la interpretación de imágenes retinográficas. La segunda fase se realizó sobre 1000 imágenes correspondientes a 200 pacientes, 100 sin retinopatía y 100 con signos de retinopatía diabética. Los participantes debían decidir si las imágenes presentaban o no signos de retinopatía diabética. Para la valoración de la concordancia se utilizó el índice kappa. Se estimó como adecuado un porcentaje de desacuerdo del 15% con una precisión del 5% (±5%) con un nivel de confianza del 95%.

Resultados: El porcentaje de diagnósticos coincidentes entre oftalmólogos y médicos de atención primaria está entre 89 y 97.5%. Por lo que respecta
was between 80 and 95%. In all cases the confidence interval was at least 85%.

Conclusions: After an adequate training process, the reliability of evaluation of non-mydriatic retinographies of diabetic patients by primary care physicians was very high. This could allow the establishment of screening for diabetic retinopathy at the primary care level. Advantages of this system include a greater involvement of primary care physicians in the global management of diabetic patients and a lower demand for ophthalmic attention (Arch Soc Esp Oftalmol 2008; 83: 527-532).

Key words: Diabetic retinopathy, non-mydriatic retinography, screening, primary care.

INTRODUCTION

The prevalence of diabetes mellitus in developed countries is in the area of 6-8% of the population. One of the most feared complications of this disease is diabetic retinopathy which can have devastating consequences for the eyesight. For an early prevention and treatment of the alterations caused by diabetes in the retina, most health authorities recommend an annual eye fundus checkup (1). However, the high prevalence of this disease leads to a high percentage of patients not taking said checkup within the recommended timeframes. In an attempt to resolve this problem, some authors propose the utilization of non-mydriatic retinography systems for eye fundus explorations (2). To date it has been considered that the interpretation of images obtained by non-mydriatic retinography systems should be left to ophthalmologists. The objective of this paper is to assess the match rates in the interpretation of non-mydriatic retinographies of diabetic patients between ophthalmologists and a group of primary care physicians who were adequately trained beforehand.

SUBJECTS, MATERIAL AND METHODS

To carry out the study, four primary care physicians were selected after exhibiting a high involvement in training actions and a disposition to innovation processes in their work. The process was divided in two stages: a first theory-based training stage and a second stage focused on assessing the matches. In turn, the training stage was divided in a further two stages: the first was person-to-person training and the second stage was online training. The former consisted in two theory session of two hours each, in which the participants were given a fully detailed explanation about the appearance of a normal eye fundus, the main pathological alterations not related to diabetes which can be found in the retina and the signs of each diabetic retinopathy stage.

The online training was individual for each participant. Upon completion of the person-to-person training, the learners were given a CD with text files and images related to the topics of the training. The CD also included a self-assessment section with 1,000 images corresponding to the eye fundus of 200 diabetic patients, i.e., five images for each patient in different fields. Out of 200 patients, half had no diabetic retinopathy and the rest had it in some degree. For each patient, the primary care physicians had to choose between 2 options: non-diabetic retinopathy or diabetic retinopathy. The objective of establishing the severity of diabetic retinopathy was deliberately excluded. The participant s had the option of consulting at any time the diagnostic of each case. The results of the diagnostics they made were added to a database included in the CD so that, at the end of the series, the percentage of matches could be verified. This self-assessment process could be repeated as many times as necessary.

When the participant s estimated that their training was adequate, they advanced to the final stage,
that of evaluating the matches. For this, the CD included a further 1,000 images of 200 diabetic patients. Of these, 100 were of patients without retinopathy and the rest of patients with some degree of diabetic retinopathy. The order of the images was different for each of the 4 participants. As in the self-assessment, for each case the physician had to determine the existence of diabetic retinopathy. In this stage, in contrast with the self-assessment procedure, the CD did not allow the participant to take a look at the real diagnostics. The diagnostic decisions were stored in another database which was sent by the participants at the end of the series, to the coordinators of the study to assess the matches. An adequate percentage of non-matches was set at 15% with a precision of 5% (±5%) with a confidence level of 95%. This estimate of a match index (Kappa) of 85% is considered to be near perfect in the classification of Landis and Koch. To avoid some of the problems attributed to the Kappa index (influenced by the prevalence of the problem), half of the retinographies were of normal patients and the other half were pathological retinographies.

The images were obtained with a TOPCON TRC NW6S non-midriatic retinograph.

RESULTS

The number of responses which matched the diagnostics made by ophthalmologists for the 200 cases ranged between 195 (97.5%) and 178 (89%). The number of false positives was between 1 (0.5%) and 14 (7%). The false negatives ranged between 4 (2%) and 13 (6.5%). One of the participants omitted 2 cases (1%), while the other 3 evaluated all 200 cases. The results are shown in Table I. In what concerns the evaluation of matches, the Kappa index is in the range of 80% - 95%. In all cases, the confidence interval includes 85%. The results are shown in Table 2.

DISCUSSION

The high prevalence of diabetes in our countries has the effect that the annual eye fundus checkup by an ophthalmologist for all diabetic patients exceeds the possibilities of most health systems. In order to remedy the problem, in recent years the non-midriatic retinography systems have been introduced as an alternative to ophthalmology consultations (2). These systems have several advantages in being more economical, require less time per patient, can be applied to populations physically removed from specialized care centers and do not require pupil dilatation. The reliability of these systems for detecting alterations caused by diabetic retinopathy is very similar to that of the classic retina exploration methods (3-5). In addition, the matches between the interpretation of digital retina images and direct exploration thereof in ophthalmology practices have been assessed and it has been found that the correlation between both systems is very high. This confirms the usefulness of the non-midriatic retinography systems as a method for screening and detecting diabetic retinopathy when compared to traditional retina exploration methods (10).

It is estimated that the prevalence of diabetic retinopathy in the population may be in the order of 25% (11). A preliminary analysis made on the first 400 patients assessed by ophthalmologists of our service using the non-midriatic retinography system revealed that the diabetic retinopathy prevalence was of 12% (figures not published). This low prevalence could be due to the fact that many patients with retina involvement are already under supervi-

Table I. Retinography interpretation results

<table>
<thead>
<tr>
<th>Participant</th>
<th>Correct Diagnostics</th>
<th>% of correct diagnostics</th>
<th>False positives</th>
<th>% of false positives</th>
<th>False negatives</th>
<th>% of false negatives</th>
<th>Not assessed</th>
<th>% of not assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>195</td>
<td>97.5%</td>
<td>1</td>
<td>0.5%</td>
<td>4</td>
<td>2%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>193</td>
<td>96.5%</td>
<td>3</td>
<td>1.5%</td>
<td>4</td>
<td>2%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>180</td>
<td>90%</td>
<td>7</td>
<td>3.5%</td>
<td>13</td>
<td>6.5%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>178</td>
<td>89%</td>
<td>14</td>
<td>7%</td>
<td>6</td>
<td>3%</td>
<td>2</td>
<td>1%</td>
</tr>
</tbody>
</table>

Table II. Evaluation of matchings

<table>
<thead>
<tr>
<th>Participant</th>
<th>Kappa Index</th>
<th>Confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>95%</td>
<td>90-99%</td>
</tr>
<tr>
<td>2</td>
<td>93%</td>
<td>80-98%</td>
</tr>
<tr>
<td>3</td>
<td>81%</td>
<td>73-89%</td>
</tr>
<tr>
<td>4</td>
<td>80%</td>
<td>72-88%</td>
</tr>
</tbody>
</table>
sion in ophthalmology practices or have visual alterations involved, in which case they are not included for assessment with non-midriatic retinography. This high percentage of patients with eye fundus classified as normal led to the idea that the primary care physicians should be in charge of evaluating retinographies after adequate training.

It is generally considered that an ophthalmologist should be the professional in charge of interpreting the retinal images obtained with non-midriatic retinography systems. Even though some studies have assessed matches in the interpretation of retinal diabetic retinopathy images between ophthalmologists and primary care physicians, none have utilized non-midriatic retinography as an exploration method (12,13). The percentage of false negatives found in the first of said studies was of 27.3% (12), whereas in the second study the authors describe a percentage of false negatives of 13% (13). The percentage of false negatives obtained in the instant study ranges between 2 and 6.5%. The false negatives are particularly relevant as they refer to patients whose eye fundus are described as normal but have some degree of diabetic retinopathy. In the second study, which also analyses the matches using the Kappa index, the authors obtained values between 6 a 70 (13), which are lower and considerably more variable than the figures of our study. We believe that the greater match rate and homogeneity achieved by our participants may be due to the learning method which, in contrast with that of other studies, includes extensive online training and can therefore be regarded as more comprehensive.

The objective of this work was to demonstrate that, after adequate training, primary health care physicians are able to differentiate with a high degree of reliability a normal eye fundus from a diabetic retinopathy eye fundus. The results we obtained with four participants confirm our approach as, after analysis with the Kappa index, the rates are within the levels previously defined as adequate. Therefore, it can be considered that, with training procedures similar to those of our study, primary care physicians are able to differentiate between a normal and diabetic retinopathy eye fundus with a high degree of reliability utilizing images obtained by means of a non-midriatic retinography system.

The clinical application of said data would involve establishing in primary care facilities a screening of diabetic retinopathy. After training primary care physicians by means of the above described procedure, the patients without diabetic retinopathy signs in retinography could continue their annual checkup by the physicians in charge of this screening, whereas the retinographies exhibiting some degree of retinopathy would be referred to the ophthalmology practice for assessment. A high percentage of patients analyzed each year by means of non-midriatic retinography exhibit eye fundus classified as normal. To exempt ophthalmologists from having to assess a high number of eye fundus without pathological alterations would allow them more time for patients with relevant problems, thus enhancing efficiency in the practices and optimization of resources. In addition, establishing in primary care a screening for diabetic retinopathy would allow general physicians a greater involvement in the comprehensive management of diabetic patients and consolidate the eye fundus exploration as an additional preventive action for them. In this way, a high number of patients could be supervised for relatively long periods of time at their health care centre.

To conclude, after an adequate training period primary care physicians are able to differentiate with a high degree of reliability a normal eye fundus from one showing signs of diabetic retinopathy in images obtained by non-midriatic retinography systems. This allows for establishing a filter at the primary health care level for screening diabetic retinopathy. The advantages comprise a greater involvement of general practitioners in the comprehensive management of their diabetic patients and reduced demand at the ophthalmology practices.

REFERENCES