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First 5 years of Implementation of Diabetic Screening Program in Centro Hospitalar do Porto

Primeiros 5 anos de Implementação do Programa de Rastreio de Retinopatia Diabética no Centro Hospitalar do Porto

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Abstract

Purpose: *To characterize the population of diabetics referred to the Ophthalmology Department of the Centro Hospitalar do Porto (CHP) from the screening program of ARS Norte, to evaluate this type of screening method and to perceive the its impact in the dynamic of an Ophthalmology Department.* ***Methods:*** *Retrospective evaluation of the clinical processes of diabetic patients referred to the CHP Diabetic Retinopathy (DR) Screening Consultation from the ARS Norte screening program, between January 2012 and December 2016. The variables analyzed were demographic data, duration and type of Diabetes Mellitus (DM), previous follow-up in ophthalmology consultation, type of diabetic retinopathy and subsequent orientation.* ***Results:*** *Of the 613 diabetic patients observed in our Department referred from this program, 2.6% had type 1 DM and 97.4% had type 2 DM, with a mean illness duration of 15.8 years. 6.6% had no lesions of DR in any of the eyes. Non-proliferative DR lesions were present in 90.7% of the patients, being bilateral in 83.7% of the cases and 2.7% had proliferative DR lesions in both eyes. At the time of the consultation, 31.9% had maculopathy in at least 1 of the eyes. 51.1% of the patients had indication for treatment at the time of the referral. 15.2% were integrated in ocular diabetes section of CHP due to the need for surveillance and 33.7% were discharged to reintegrate this screening program.* ***Conclusions:*** *The DR screening program is a useful and necessary tool for the early diagnosis and early treatment of DR lesions.*

Keywords: *Diabetes; Diabetic retinopathy; Screening; Retinography; Portugal*

Resumo

Objetivo: Caracterizar a população de diabéticos referenciados à consulta de Oftalmologia do Centro Hospitalar do Porto (CHP) através do programa de rastreio da ARS Norte, avaliar este tipo de método de rastreio e perceber o impacto do mesmo na dinâmica de um Serviço de Oftalmologia. **Métodos:** Avaliação retrospetiva dos processos clínicos dos utentes diabéticos referenciados à consulta de Rastreio de Retinopatia Diabética (RD) do CHP através do programa de rastreio da ARS Norte, entre Janeiro de 2012 e Dezembro de 2016. As variáveis analisadas foram: dados demográficos, duração e tipo de Diabetes Mellitus (DM), seguimento prévio em consulta de oftalmologia, tipo de retinopatia diabética e orientação subsequente. **Resultados:** Dos 613 doentes diabéticos observados nesta consulta 2.6% tinham DM tipo 1 e 97.4% tinham DM tipo 2, com duração média da doença de 15.8 anos e 6.6% não apresentava lesões de RD em qualquer um dos olhos; lesões de RD não proliferativa estavam presentes em 90.7% dos doentes, sendo bilaterais em 83.7% dos casos e 2.7% apresentava lesões de RD proliferativa em ambos os olhos. No momento da consulta, 31.9% apresentava maculopatia, em pelo menos um dos olhos. 51,1% dos doentes tinha no momento da consulta indicação para tratamento; 15.2% integraram a consulta de diabetes ocular do CHP por necessidade de vigilância e 33.7% tiveram alta para reintegrarem este programa de rastreio. **Conclusões:** O programa de rastreio de RD apresenta-se como uma ferramenta útil e necessária no diagnóstico precoce e tratamento atempado das lesões de RD.

Descritores: Diabetes; Retinopatia diabética; Rastreio; Retinografia; Portugal

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Introduction

Diabetic Retinopathy (DR) is one of the leading causes of avoidable blindness in the active population. [1-3] According to data from the National Diabetes Observatory's annual report for 2016, in 2015 the estimated prevalence of Diabetes Mellitus (DM) in the Portuguese population aged between 20 and 79 years (7.7 million individuals) was 13.3%. The average annual growth rate of new cases between 2006 and 2015 was 2.8%. In 2015, 6% of hospitalizations in patients with DM were due to diseases of the eyes and appendages. [4]

The early stages of DR are generally asymptomatic, which is why Administração Regional de Saúde (ARS) do Norte distributed normative regulation No. 7/DGCG of 11/4/98 by Direção Geral de Saúde (DGS) implemening the program of Systematic Diagnosis and Treatment of Diabetic Retinopathy in the Northern Region. Upon creation, this program aimed to ophthalmologically screen 75% of the diabetic patients identified, and to treat 98% of diabetic patients requiring treatment with LASER. [5]

According to this screening program, diabetic patients are called by the health center of their area of residence for the retinography of both retinal fields, both with 45º field, one focusing on the macula and the other on the optic nerve. Diabetic patients already submitted to photocoagulation treatment undergo 5 retinographies, one focused on the macula and the others in the 4 quadrants. The retinographies of patients living in the area of Centro Hospitalar do Porto (CHP) are performed by the orthotic technicians of this center who organize their activity in cycles of 2 months dedicated to hospital activity and 1 month dedicated to DR screening. Retinopathies are performed under mesopic conditions and without dilatation, using the non-mydriatic chamber, CR-2 Digital Retinal Camera (Canon®). On average, daily markings are used to retinograph the 40 diabetics. [6,7] The images are then sent to the retinography reading center (headquartered at Hospital de São João, Porto). They are evaluated and classified by an ophthalmologist according to the criteria presented in table 1.

Table 1
Criteria for the classification of diabetic retinopathy

	Diabetic retinopathy
R0	Without DR
R1	Mild non-proliferative DR - Microaneurysms, retinal hemorrhages +/- any exudate excluding the definition of maculopathy
R2	Pre-proliferative DR (moderate or severe) - rosary veins, venous loops and duplications, intra-retinal microvascular, multile, deep anomalies, cottony exudates
R3	Proliferative DR - disk neovases, retinal neovases, vitreous or pre-retinal haemorrhage, pre-retinal fibrosis +/- traditional retinal detachment
	Maculopathy
M0	No maculopathy
M1	Exudates less than one disc diameter (DD) from the center of the fovea, circinata or grouped exudates in the macular area, retinal thickening at less than 1 DD from the center of the fovea, any microaneurysm or haemorrhage less than 1 DD from the center of the fovea , if associated with an AV <0.5
	Photocoagulation
P0	Photocoagulated retina not requiring further treatment
P1	Photocoagulated retina requiring further treatment
	Outros
	Not classifiable Non-informative image

Patients with results R2, R3, M1 and P1 are referred to the ophthalmology department of the hospital in the area of residence for treatment. In the organization of DR screening at ARS Norte, the evaluation of visual acuity is not included, since it would make it slow and decrease the number of diabetic patients tracked per day. All this process is done with the support of a computer application developed for this purpose -SiiMAscreens.

The number of people with DM covered by the DR Tracking Programs has increased since 2009 (+283%). According to the ARS activities report of 2015, the North region is currently the region of the country with more diabetic patients in the DR screening program, having carried out 49354, 57385, 47454, 45121 and 68309 retinographies from 2012 to 2016, respectively. An average of 6.5% of these patients were identified with criteria for hospital referral from 2012 to 2016. [7]

The objective of the present study is to characterize the diabetic population referred to the Ophthalmology Appointment External to CHP between 2012 and 2016 through the DR screening program, evaluate this screening method and its impact on the dynamics of an Ophthalmology Service, aiming at a better optimization of resources.

Methods

The present study results from a retrospective study of the analysis of clinical processes in diabetic patients referenced to appointment for DR Screening at CHP through the ARS Norte screening program from January 2012 to December 2016. We analyzed the following variables in the present study: demographic data, duration and type of Diabetes Mellitus, type of diabetic retinopathy and subsequent guidance given to these patients, as well as the time required to complete a screening cycle.

Results

The CHP is the reference hospital of two groups of health centers (ACeS), ACeS de Gondomar and ACeS do Porto Ocidental, which together account for about 293,900 inhabitants. These two ACeS diagnosed 24,902 patients with Diabetes Mellitus by the end of 2016.

Currently, a DR screening cycle in ARS Norte is completed in 20 months.

In the period between January 2012 and December 2016, they were referred to the DR screening appointment for CHP1494 patients. Of these, 56% were canceled because they already had follow-up at the CHP. Of the remainder, 50% were referred with moderate to severe non-proliferative DR lesions, 38.8% with maculopathy in at least one eye, and 2% with proliferative DR in at least one eye.

We effectively observed 613 diabetic patients during the study period. The waiting time for the appointment after referral was less than 30 days. Of the 613 patients observed, 40.5% were female and 59.5% male, with average age of 65 ± 10.9 years. Of these patients, 2.6% had DM type 1 and 97.4% had DM type 2, with average illness duration of 15.8 ± 9. 7 years, with 28% being treated with insulin.

Regarding the co-existence of other concomitant vascular risk factors, 60.2% and 47.5% of the patients observed also had a diagnosis of hypertension and dyslipidemia, respectively.

Of the 613 patients observed in this appointment, 9% (n=55) were already being regularly having ophthalmologic follow-up at another institution or hospital, and therefore they were discharged from the screening appointment.

Of the remaining 558 patients, and despite referral, 6.6% (n = 37) had no DR lesions in either eyes. Of these patients without DR, 21.6% presented venous occlusion with macular edema, 8.1% exudative macular degeneration in at least one eye, 8.1% epiretinal membrane associated with macular edema, and 2.7% macroaneurysm. Non-proliferative DR lesions were present in 90.7% of patients, being bilateral in 83.7% of cases. Of the patients with bilateral nonproliferative DR, it was mild in 21% of patients and moderate to severe in 79% of them. 4. Of the patients, 7% had proliferative DR lesions, and 2.7% had bilateral lesions. We identified 31.9% cases of maculopathy, bilateral in 17.4%. Figure 1 graphically shows the distribution of the type of diabetic retinopathy identified.

Regarding the complementary diagnostic tests, 62% of these patients underwent fluorescein angiography, and 89% underwent macular optical coherence tomography.

Regarding treatment, 49.5% of DR patients were effectively treated. Of the remaining patients, 1.6% were either absent from the proposed treatment sessions or refused treatment, 15.2% were enrolled in the CHP ocular diabetes appointment, and 33.7% were discharged to re-integrate this screening program.

The average time to start treatment was 50 days. The majority of the patients treated (82.4%) underwent LASER photocoagulation. Intravitreal injections were used to treat 29.2% of patients, mostly anti-VEGF (vascular endothelial growth factor). Vitrectomy was required in 7.3% of cases.

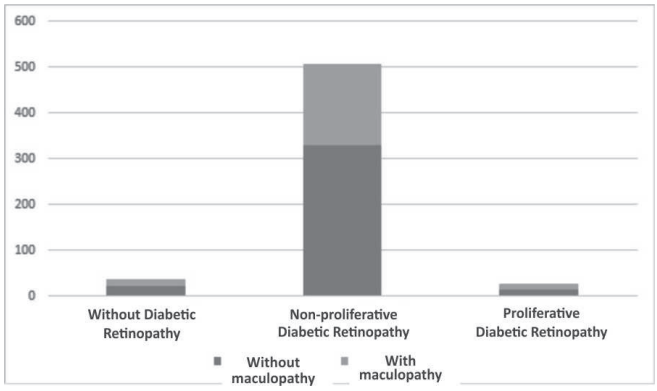

Figure 1: Distribution of the type of Diabetic Retinopathy identified in the population evaluated

Discussion

The objective of the present study was to analyze the results of the first 5 years of implementation of the DR screening program at CHP, identifying the advantages and limitations of the program in order to improve its execution. The patients referenced by this program were mostly elderly (age >65 years) diagnosed with DM type 2 and an average time of disease of 16 years. We found out the co-existence of cardiovascular risk factors, namely arterial hypertension and dyslipidemia, is frequent.

More than 80% of patients observed in this appointment did not present regular follow-up in the ophthalmology appointment. The fact that 93.4% of these patients present DR lesions, and about 70% of them be moderate to severe non-proliferative DR or proliferative DR and 31.9% be commaculopathy, emphasizes the importance of having a screening program. Regarding false positives, in which the percentage was low (6.6%), their referral also allowed treating other diseases equally in need of referral, evaluation or treatment.

This screening program is undoubtedly an asset in improving the quality of health of the population. However, some points in its organization constitute structural, technical and management difficulties, which put obstacles to the best optimization of the resources and to the universalization of the implementation of this program.

Regarding the selection of patients to be called by family doctors, it is difficult to cross data between the hospital computer systems and primary health care.[6] Thus, patients already followed in the hospital and who would not require integration into the screening program are unnecessarily called to the screening program. Likewise, the exam is carried out even if the patient informs the orthotic technician they are already being followed, and a comment must be added to the retinography to notify the reading center that the patient has an ophthalmological follow-up. Later on, the hospital clinical secretaries must select patients already

followed at the hospital appointment to cancel this referral. [6] In our analysis, 840 patients were discharged during this period, accounting for 56% of patients who were referred.

Regarding the referral criteria after reading the retinographies, there are also some limitations. Patients with maculopathy should be referred in case the visual acuity is below 5/10 associated with imaging criteria, which brings the need for an assessment of visual acuity. However, visual acuity is not evaluated in the North region, and this fact can lead to excessive referral for better characterization and guidance of maculopathy. Likewise, a good visual acuity does not exclude the existence of significant maculopathy in need of treatment. Patients with pan-photocoagulated diabetic retinopathy are also difficult to show the need of treatment without referral for hospital appointment. Retinography presents diagnostic limitations of potential cases requiring treatment, such as the evidence of macular edema (due to the impossibility of the exam providing stereopsia) and the possible existence of rubeosis or neovascular glaucoma, and although they are rare clinical situations in a screening context, they are severe when undiagnosed.

In terms of hospital resources, the technicians involved in this program are dispensed by the hospital, letting the technicians overloaded, who must ensure the regular operation of the ophthalmology service. This screening program also represents an increase in referrals to external ophthalmology appointment and subsequent significant increase in ocular diabetes appointments. Access to retinographies is available, thus implying that SiiMA tracks access to an external database where these are.

Regarding treatment, the program only includes a response to patients who need laser treatment[5], and is not adequate to the current state of the art of DR treatment. Since the beginning of the implementation of this program in our service, patients in need of treatment are treated according to the treatment criteria applied in the appointment for ocular diabetes, which includes intravitreal injections, anti-VEGF or corticoids, or vitrectomy. These treatments were applied to 29.2% and 7.3% of cases respectively in the period studied, and were not included in the funding under this program.

The use of non-mydriatic chamber retinography showed a favorable performance and was cost-effective in several international studies. [8-14]Alternative screening methods such as associating OCT, portable fundoscopy or technologies based on the use of smartphones are described, but studies are still scarce. [15-19]

The referral range of diabetic patients to this program has also been studied in order to maintain its adequacy to the development of the disease, but improving the management of human and material resources. Currently, a DR screening cycle in ARS Norte is completed in 20 months. Echouffo-Tcheugui et. Al., in his systematic review of the DR screening interval, suggest that the overall guidance of the various studies in this field based on the natural history of the disease and the cost-effectiveness of these programs will be to adopt a range greater than one year but less than or equal to two years. [20] Thus, the RD screening interval in the diabetic population of the ARS Norte seems to be in line with current global trends. However, in order to prevent this range from increasing due to the increasing incidence of diabetes, ARS Norte and CHP have a plan to expand the screening program with the acquisition of another retinograph and the future hiring of more professionals for this area.

It seems clear to us the relevance and the advantage to public health of this screening program. However, given the lack of such publications about the national reality regarding the implementation of this screening program, it is essential to invest in national studies to interpret the results of this program to better understand its true cost-effectiveness.

Conclusion

The DR screening program is a useful and necessary tool for the early diagnosis and early treatment of DR lesions. However, it represents an increased effort of the ophthalmology services involved in this process, and its implementation is dependent upon cooperation among health centers, orthotic technicians and ophthalmology services, as well as the operation of computer systems. Optimization of all steps in this program, including automatic cross-referencing of patients data already under treatment and interconnection with hospital imaging systems will allow better management of program resources and effectiveness.

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