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Screening for Diabetic Retinopathy by General Practitioners

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To assess the quality of screening for diabetic retinopathy by 19 general practitioners (GPs) using ophthalmoscopy, the GPs' performance was compared with the performance of ophthalmologists. The GPs had received special training in retinal examination. Direct ophthalmoscopy was performed after mydriasis of both eyes. Later, one of the ophthalmologists at the local hospital performed ophthalmoscopy in the same way as the GP. The ophthalmologist's diagnosis was used as the criterion for retinopathy.

252 NIDDM patients were analysed. The ophthalmologists found 23 cases of retinopathy, of which one patient was referred immediately for photocoagulation. The GPs diagnosed 12 and missed 11 of these 23 cases (false negatives): sensitivity 52%. In 37 of the 229 negative cases the GPs reported a retinopathy: specificity 84%. Of the 11 missed cases, 7 had stage I retinopathy and four showed more serious abnormalities (hard and soft exudates, macular oedema) Further training of GPs in the art of ophthalmoscopy is recommended.

Key words: diabetic retinopathy, general practitioners, opthalmoscopy, screening, diagnosis.

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Diabetic retinopathy is an important cause of blindness (1). Treatment with photocoagulation of the serious stages (maculopathy and proliferative retinopathy) can prevent some 60% of blindness (2,3). Therefore, it is essential to detect patients with sight-threatening retinopathy at an early, treatable stage. Guidelines for the management of patients with diabetes mellitus indicate the need for annual screening (4–5). The reality of daily care seems quite different. An important number of patients are never examined, or only occasionally (6). This is particularly the case in general practice, where the majority of patients with non-insulin dependent diabetes mellitus (NIDDM) are cared for. Screening by ophthalmic opticians (7.8) or diabetologists (9) has been studied in an effort to reduce the waiting lists of ophthalmologists. The quality of their screening was equal to that of ophthalmologists. Screening of patients with diabetes by their own general practitioner (GP) is an often discussed alternative (10–12).

The present paper assesses the quality of screening for diabetic retinopathy by GPs, who had received special training in retinal examination, and compared it with the performance of ophthalmologists. It is part of a study of the prevalence of late complications of NIDDM in general practice and on the strategies of adequate detection of late complications by GPs.

MATERIALS AND METHODS

The study took place in the region of Hoogeveen, The Netherlands. 19 of the 26 GPs in the area took part in the study (combined list size: 41 940). There is one regional hospital in the area, with two ophthalmologists. The study was part of a systematic surveillance for late complications. The following protocol was used for the screening for retinopathy.

The GP examined his own NIDDM patients. The examination consisted of a history of symptoms of the eye and an examination of both eyes: visual acuity (standard Snellen chart) and ophthalmoscopy. Direct ophthalmoscopy was performed after mydriasis (one drop of 0.5% tropicamide in each eye 10–15 minutes before ophthalmoscopy) in a darkened room, using a Heine ophthalmoscope. The

Table I. Stages of diabetic retinopathy.

0:	No retinopathy
I:	Microaneurysm, and/or haemorrhage
II:	Hard exudate
III:	Soft exudate, and/or macular oedema
IV:	New vessel and/or retinal detachment and/or vitreous bleeding

findings were recorded on a form which specified for each fundus the presence or absence of the following characteristics: microaneurysm, haemorrhage, hard exudate, soft exudate, macular oedema, new vessels, retinal detachment, and vitreous bleeding. After their examination, the GPs referred the patient to one of the ophthalmologists. The results of the GPs' examination were not given to the patient or to the specialist.

The ophthalmologist performed and reported his examination in the same way as the GP. The interval between the examinations was less than two months. Before the study took place a special training course was organized (two evenings of two and a half hours each). The GPs practiced mydriasis and ophthalmoscopy on phantoms and on volunteer-patients, supervised by the two ophthalmologists. The report form was tested as well. An analysis of the effect of the training revealed improvement of the GPs' skills (13).

There were 610 patients with diabetes mellitus in the participating practices. The 507 NIDDM patients were invited to participate in the study of the prevalence of complications. 387 NIDDM patients took part in that study, but 97 of them were excluded from the present study because the GP was aware of the ophthalmologist's diagnosis beforehand (20 patients treated for diabetic retinopathy and 77 already examined by the ophthalmologist within the past year). 38 other patients were excluded as follows: GP unable to assess the retina (18 patients), patients refused referral to ophthalmologist (20).

Table II. Ophtalmoscopy by general practitioners compared with ophthalmoscopy by ophthalmologists in screening 252 NIDDM patients for diabetic retinopathy.

		Ophthalmologist		
	DRP	+	−	Total
General practitioner	+	12	37	49
	−	11	192	203
	Total	23	229	252

In an analysis of the data from the remaining 252 patients, a comparison was made between the GPs' and the ophthalmologists' assessments. The GPs were considered as one group; the two ophthalmologists were taken together as well.

In each patient only the results in the most affected eye were taken into account. The assessment of the ophthalmologist was regarded as the criterion of retinopathy. To calculate the consequences of the cases missed by the GPs the characteristics of retinopathy were divided into four stages: stage I, microaneurysm and/or haemorrhage; stage II, hard exudate; stage III, preproliferative retinopathy; stage IV, proliferative retinopathy (Table I).

RESULTS

The ophthalmologists found 23 cases of retinopathy (Table II): a prevalence of 9%. Only one patient (stage IV) was referred immediately to a centre for photocoagulation. Fifteen of the 23 (65%) cases had a known duration of diabetes mellitus of more than 10 years, and 21 of more than 3 years. 14 had not been seen by an ophthalmologist during the previous three years.

The GPs found 12 and missed 11 cases of retinopathy: a sensitivity of 52%. Most of the missed cases had retinopathy of an early stage (Table III). In 37 of the 229 negative cases the GPs assessed retinopathy (false positives). This resulted in a specificity of 84%. The 37 false positive cases were equally divided between the four stages of retinopathy (Table III). The GPs "diagnosed" in these cases: microaneurysm (6 times), haemorrhage (4), hard exudate (13), soft exudate (5), macular oedema (4), and new vessels (7), while the ophthalmologists found cataract (18), macular degeneration (1), and a residual scar following retinal detachment (1). Two of the 19 GPs were responsible for 19 of the 37 false positives. In the 48 cases of disagreement between the GPs and the ophthalmologists, the interval between the respective examinations was 15 (1–49) days.

DISCUSSION

The prevalence of retinopathy in NIDDM patients is high (14,15). The finding in our study of previously

Table III. The positive, false negative, and false positive cases found by GPs and the cases of retinopathy found by the ophthalmologists, by stage of diabetic retinopathy.

	Ophthalmologists	GP		
	found n = 23	positive n = 12	false negat. n = 11	false pos. n = 37
Stage I	16	9	7	8
Stage II	4	2	2	10
Stage III	2	0	2	9
Stage IV	1	1	0	10

unknown retinopathy in 23 patients (9%) underlines the need for regular screening of NIDDM patients for retinopathy, since early detection is the only way of selecting patients for correct treatment. In this study one of the 23 cases was treated immediately following the detection of retinopathy.

The criterion for retinopathy was the ophthalmologists' opinion. The ophthalmologists' opinion has been used as a criterion in numerous studies on fundus photography (15–18) or ophthalmoscopy by physicians (9) or ophthalmic opticians (8). This seems logical, since any new method should be compared with the standard one. In the present study, 6 of the cases with stage II–IV retinopathy, diagnosed by the ophthalmologists, were confirmed by further examination (one patient died soon after the first examination). The sensitivity of 52% and the specificity of 84% of the GPs' performance for serious retinopathy are in agreement with those of Sussman et al. (19), in a study of the screening performance of non-ophthalmic physicians. That the GPs in our study overlooked 11 of the 23 cases of retinopathy is obviously serious with respect to treatment. However, 7 of these patients were in stage I (microaneurysm, small haemorrhage) and did not require immediate treatment. They were asked to return for an annual follow up, as has been previously advised (20). Repeated yearly screening by the GP might have revealed the retinopathy. In three of the four stage II–IV missed cases, deficiencies in performing ophthalmoscopy (no mydriasis in one case) and doubts about the abnormal fundus (two cases) could be traced. The fact that all patients had to be referred to the ophthalmologist may have influenced the decisions made by the GP in doubtful cases. Cataract probably played a role in 18 of the 37 false positive cases. The number of referred false positive cases should be compared with the GPs' correct labelling of 192 patients without retinopathy. If annual screening of NIDDM patients is good practice, screening by GPs would considerably diminish the referral figure. In the Netherlands as in the U. K. (20), the number of ophthalmologists is insufficient to cope satisfactorily with the screening of patients with diabetes mellitus. Opticians and optometrists are not qualified to perform ophthalmoscopy (8). Non-mydriatic fundus photography is an alternative. However, the initial enthusiasm (21) has been replaced by some doubts about this method: the non-mydriatic camera fails to detect lesions in the periphery of the fundus, a rather large percentage of the photographs is technically unsatisfactory, and an important number of cases of macular oedema (16,20) are missed by both camera and direct ophthalmoscopy.

The implementation of a screening programme using a fundus camera in primary care seems difficult.

The European Retinopathy Working Party (5) concluded that direct ophthalmoscopy through dilated pupils is the recommended method of screening for diabetic retinopathy, because it is inexpensive, efficient, and rapid, but it should always be performed by a trained observer. It might be concluded that much has to be done to improve the standard of GPs' screening for retinopathy. Teaching sessions are necessary and should be more extensive than has been mentioned in the study. But it is just as important to maintain skills in practice. To achieve this, we recommend regular screening for retinopathy by the GP, combined with a liberal referral policy to ophthalmologists and systematic feedback of their assessment to the GP. This should result in a continuous practical training of the GP in screening for retinopathy.

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