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Assessment of retinopathy

Warren Gillibrand and Phil Holdich explain the importance of screening all patients with diabetes annually for retinopathy as in the majority of cases effective treatment can be given to maintain visual function

Diabetic retinopathy is a serious complication of diabetes and can have severe debilitating effects on lifestyle, work and relationships. In the UK diabetic retinopathy remains the main cause of visual impairment and registered blindness in people under 65 years of age (Bunce and Wormald, 2006; Kumar et al, 2006). This is despite evidence that 60–80% of visual loss is preventable by laser treatment (Dineen et al, 2008).

To be effective treatment for retinopathy needs to be given at the appropriate stage of the disease, often before symptoms have developed; thus the importance of screening to detect the signs of retinopathy before they progress (Arun et al. 2005).

The prevalence and incidence of type 1 and type 2 diabetes continues to rise, although type 2 diabetes may

be preventable in many cases (Amos et al, 1997; Yorkshire and Humberside Public Health Observatory, 2009; Tuomilehto et al, 2001). Data from large studies of the microvascular complications of diabetes, demonstrate that diabetic retinopathy can be prevented and managed effectively through good management (Diabetes Control and Complications Trial (DCCT) 1993; United Kingdom Prospective Diabetes Study (UKPDS), 1999). Results from the UKPDS show that a reduction in HbA_{1c} reduces the risk of microvascular complications by up to 21% ($P < 0.0001$) (Stratton et al, 2000) (Figure 1).

Progression of retinopathy

In diabetes there is considerable fluctuation in the blood glucose levels and abnormally high levels have an effect on the small blood vessels (capillaries) of the eyes, kidneys and those that feed the nerves. As a result, the capillary wall becomes thickened in small areas and forms microaneurysms, which eventually burst, causing haemorrhage.

If enough of this abnormal physiology occurs, the organs affected do not receive enough blood supply to function properly, which leads to triggering of ischaemic and scarring responses.

Diabetic retinopathy is a progressive disease and is

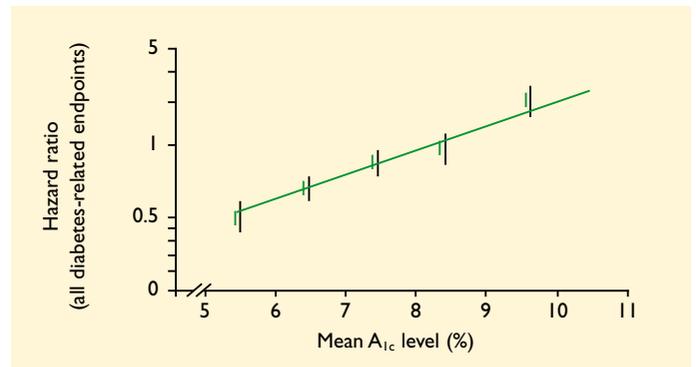


Figure 1. Lowering HbA_{1c} reduces the risk of diabetes complications in people with type 2 diabetes (UKPDS 35) (Stratton et al, 2000)

classified in four main stages: background, pre-proliferative, proliferative, and advanced retinopathy.

Background retinopathy

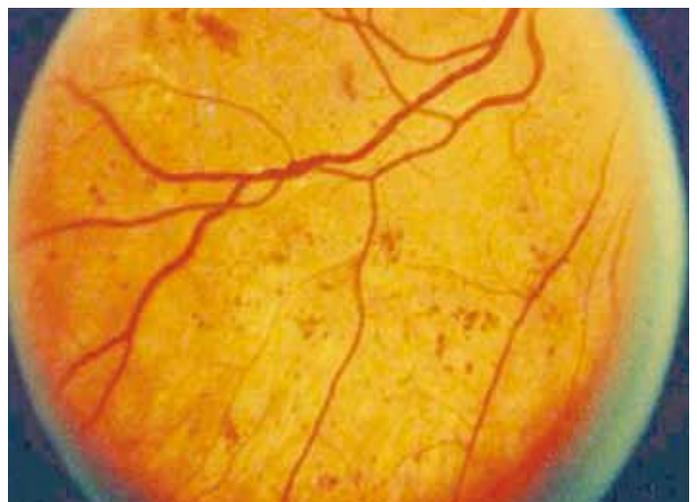
The term ‘background retinopathy’ is used to describe the appearance of microaneurysms and haemorrhages on fundus examination, commonly termed ‘dot and blot

haemorrhages’ (Figure 2).

It is important to consider what having background retinopathy means for the person with diabetes.

Background retinopathy will not result in visual symptoms. However, it is important to consider how effectively the patient is managing his/her diabetes by monitoring HbA_{1c} and blood pressure levels. A lifestyle or treatment change may be

Figure 2. Fundus of a person with diabetes, showing the characteristic ‘dot’ and ‘blot’ haemorrhages in background retinopathy.



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needed to improve control.

Practice indicators

- ▶ Ensure the patient is under an annual photographic screening programme for diabetic eye disease. Patients with background retinopathy only need to be re-screened once a year and do not need referral to an ophthalmology service
- ▶ Agree changes to a shared care plan for improved diabetes management
- ▶ Check that the retinopathy level is recorded on the patient record system.

Pre-proliferative retinopathy

Pre-proliferative retinopathy indicates signs of ischaemia, i.e. tissue death, resulting from the loss of blood supply to those affected areas of the retina. Features include cotton wool spots—small areas of ischaemia on the retina comprising venous beading and reduplication or looping of blood vessels, which have become abnormal in appearance—and intraretinal microvascular abnormalities, which present as tortuous dilated blood vessels caused by retinal ischaemia.

Pre-proliferative retinopathy presents with no visual symptoms, but is considered hazardous and a precursor to more severe sight-threatening eye disease. Pre-proliferative retinopathy is divided into mild, moderate and severe, indicating a progression toward proliferation.

Practice indicators

- ▶ Review patient management and shared care plan—consider changes to improve control
- ▶ The patient needs to be

Figure 3. Fundus of a person with diabetes showing neo-vascularization associated with proliferative retinopathy.



under regular (3-6 months) ophthalmology service review.

- ▶ Check that the retinopathy level is recorded on the patient record data system.

Proliferative retinopathy

Proliferative retinopathy is the manifestation of neovascular growth either in the peripheral fundus or at the optic disc (Figure 3). This occurs when retinal blood supply is no longer sufficient, resulting in abnormal vessel growth. These new vessels, however, are fragile and do not follow normal anatomical routes. They are prone to bleed, causing pre-retinal haemorrhage or vitreous haemorrhage. Visual loss may be complete or partial in the affected eye. However, before this occurs the patient may not experience any symptoms, unaware that severe sight threatening eye disease has developed.

Until the blood vessels bleed the patient may be unaware that he/she has sight-

threatening eye disease, as there may be no visual symptoms.

Practice indicators

- ▶ If proliferative retinopathy is picked up by screening, the patient should be referred urgently for laser treatment by ophthalmology services. Laser treatment is the intervention that prevents partial sight registration and blindness in diabetes. It is highly effective working in up to 90% of patients (Dineen et al, 2008). The laser burns and destroys the peripheral parts of the retina, which stops the proliferation of new vessel growth and concentrates the blood supply to the important central areas of the retina, the macula
- ▶ If the vessels bleed, laser and possibly surgery may be required to clear the blood. However, the prognosis for retaining vision is adversely affected

by continued new vessel bleeding and can lead to the next 'end stage' of severe advanced retinopathy.

Advanced retinopathy

'Advanced retinopathy' is the term used to describe the late complications of neo-vascular growth. The new vessels are eventually accompanied by fibrous proliferation, which contracts causing traction and retinal detachment. The visual prognosis for people with advanced stage retinopathy is poor, usually resulting in blindness or partial sight registration.

Having advanced retinopathy usually means that the patient will be registered blind or partially sighted. As a consequence, the patient may only be able to see vague shapes, light and dark or nothing at all. Most people retain some sight despite being registered blind.

Practice indicators

- ▶ Appropriate support services referrals, e.g. to social services, guide dogs for the blind, RNIB
- ▶ Re-organization of a shared-care plan and review of diabetes management
- ▶ Appropriate psychological monitoring and support
- ▶ Specialist ophthalmic services
- ▶ Referral to a low visual aids clinic, either via the local ophthalmology department or RNIB.

Maculopathy

One further classification is used in the detection of diabetic retinopathy. Maculopathy is the manifestation of diabetic

retinopathy which occurs in the macular area of the fundus, which is used for detailed vision. Signs of maculopathy are exudates and clinically significant macular oedema. Oedema is sight threatening and is usually manifest to the patient as blurred vision. It can only be detected by stereoscopic examination of the fundus.

Health education

Health education is a vital strategy which can empower patients to seek annual eye checks and give patients the encouragement and knowledge to take control of their diabetes by following a healthy lifestyle.

Health education is necessary but must be tailored to individuals' needs in the context of their particular lifestyle with the differing coping and cognitive mechanisms considered, i.e. a psycho-educational approach (Duke et al 2009). A variety of sources of health information are available for health professionals from each of the devolved health services (*Table 1*).

Strategies for health

Table 1. Resources

England: National Screening Programme for Diabetic Retinopathy
www.retinalscreening.nhs.uk/pages

Northern Ireland: Diabetic Retinopathy Screening
www.dhsspsni.gov.uk/public_health_diabetic_retinopathy

Scotland: National Diabetes Retinopathy Screening Collaborative
www.ndrs.scot.nhs.uk

Wales: Diabetic Retinopathy Screening Service for Wales
<http://tinyurl.com/3a2423w>

education include individual education sessions, group talks and use of local health promotion services.

Practice indicators

- ▶ Inform patients with diabetes that they should be annually screened by photography for signs of eye disease, unless they are already under the care of a consultant specialist ophthalmic service.
- ▶ Continue to instigate lifestyle change motivators and agreed shared care plans based on the patients quality of life indicators, to aid in improved diabetes

control including blood pressure.

- ▶ Patients should know that diabetes can cause blindness but is preventable if detected early enough.

Current NHS Policy

The NSPDR (2008) recommends fully validated and tested screening programme, coordinated and funded by the local health authority and primary care trusts, using a digital photography system to screen all people with diabetes annually.

The *National Service Framework for Diabetes* (Department of Health (DH), 2002) set an initial target of establishing a screening programme for the detection of diabetic retinopathy that would offer annual screening to all people with diabetes by 2007 (Gillibrand et al, 2004; NSPDR, 2008). This first target was based on the level of current evidence and services available for the detection of diabetic retinopathy and is detailed in standard 10 of the national service framework (DH, 2002).

Current NHS reporting recommends that all people with diabetes have the opportunity for screening, however the target uptake of 90% is not always achieved (NSPDR, 2008).

Patient experience

It is important to consider the patient's experience and the benefits of attending the screening programme. There have been some attempts in the literature to explore reasons for non-attendance to screening which have revealed; fear, lack of knowledge, economics, poor access; social deprivation; duration of diabetes; and equity (Gillibrand et al, 2000a; 2001; Hartnett et al, 2005; Millett and Dodhia, 2006; Leese et al, 2008).

Methods to improve attendance have focused on group education sessions using local networks, culturally sensitive education, accessibility, and conducting regular equity audits (Livingston et al, 1998; Gillibrand et al, 2000b; Millett and Dodhia, 2006).

The NSPDR (2008) has published guidelines and

educational material for practitioners in England to use in supporting and maintaining an acceptable level of attendance. In Scotland, the Manual for the Diabetic Retinopathy Screening Programme for Scotland is available online from the (National Diabetes Retinopathy Screening, 2010).

Conclusions

There is a good evidence base to support early detection via screening and treatment of diabetic retinopathy (National

Institute for Health and Clinical Excellence (NICE), 2008). With good service development and implementation, many patients can avoid progressing to advanced retinopathy and suffering visual impairment. Robust clinical trials have demonstrated that people with type 1 and type 2 diabetes can reduce the incidence and severity of complications through strict control of their diabetes (DCCT, 1993; UKPDS, 1998). Therefore if people with

diabetes can maintain stable blood glucose levels they will be more likely not to develop complications and will reduce the severity. The practice nurse has an important role in educating patients about diabetic retinopathy, to ensure that all their patients attend annual retinopathy screening, and provide diabetes management support, to prevent complications of diabetes developing.

Conflict of interest: none

References

CASE STUDY

Michael is a 56-year-old married man, with two children. He was diagnosed with type 2 diabetes 8 years ago after a visit to the GP with symptoms of polyuria and fatigue, confirmed by a fasting blood glucose test. He managed well for a short time on a diet and exercise regimen, but owing to weight gain and a rise in glycated haemoglobin (HbA_{1c}), to 70 mmol/mol (8.6%), he started on metformin. His blood pressure is 152/86 mmHg (150/88 mmHg on last recording) but he is not currently receiving any treatment for this.

Recently Michael was invited to attend the optician for an annual retinopathy screening examination. He was sent a letter, co-ordinated by the PCT, which informed him about the screening and advised that he should not drive to and from the optician. At the examination, Michael was given an explanation of the procedure by the retinal screener and invited to ask questions. The screening assessment began with a check of Michael's visual acuity, as some forms of retinopathy can affect vision in the early stages. His pupils were then dilated using tropicamide 1%. The National Screening Programme for Diabetic Retinopathy (2008) recommends tropicamide 1% eye drops as the most effective for pupil dilation for fundus photography and the least likely to

cause adverse reactions).

After the pupils were dilated, a number of digital images were taken of each fundus and stored on the computer for later grading of retinopathy by the screener. Two weeks later, Michael received a letter from his general practice stating that pre-proliferative retinopathy had been detected. He was referred to ophthalmology at the local hospital. At the hospital, a detailed examination was carried out, and the consultant ophthalmologist recommended a 6-month follow-up to monitor progress.

Michael also attended a consultation with the practice nurse at his health centre, where an agreed shared care plan was devised, with the main goal to help Michael do more exercise, reduce his weight and improve his glycaemic control. The nurse discussed a blood pressure target of 130/80 mmHg.

Following NICE guidance (2008) she recommended an ACE inhibitor (enalapril 5 mg) following a check of his renal function and electrolytes. In follow-up checks his dose was titrated to 20 mg daily. Michael's HbA_{1c} fell to 62 mmol/mol (7.8%) and his blood pressure was 136/82 mmHg at the ophthalmologist review, the pre-proliferative signs had reduced, with no progression to the proliferative stage.

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KEY POINTS

- All people with diabetes should be screened annually for diabetic retinopathy by a validated digital photography method
- Patients should be supported by the practice nurse in managing their diabetes to prevent diabetic retinopathy
- There is good evidence that the majority of diabetic retinopathy can be effectively treated to maintain visual function, if detected early enough