Screening for diabetic retinopathy

All patients with diabetes are at risk of developing diabetic retinopathy.

J Rice, FCOphth (SA)
Ophthalmologist, Division of Ophthalmology, Faculty of Health Sciences, University of Cape Town, South Africa

Correspondence to: J Rice (james.rice@uct.ac.za)

Good glucose control and the treatment of hypertension and hyperlipidaemia remain the key strategies in preventing diabetic retinopathy and its progression. Unfortunately, some degree of retinopathy will eventually develop in almost all type 1 diabetics and over 60% of type 2 diabetics over a 20-year period.

Diabetic retinopathy is usually asymptomatic in its early stages. Patients presenting with symptoms often have more advanced disease and are more difficult to manage. They are at higher risk of permanent visual loss. Screening is a cost-effective tool in the fight against diabetic blindness. It involves assessment of visual acuity (including the use of a pinhole to overcome refractive error) and a retinal examination (fundoscopy) through a dilated pupil.

With the rising prevalence of diabetes there is an increasing need for effective retinal screening. Fundus photography has established itself in many countries as the preferred tool for screening for diabetic retinopathy. Unfortunately fundus cameras are expensive and not yet widely available. While such screening programmes are being developed in the private and public sectors in South Africa, screening with a direct ophthalmoscope still has an important place in the detection of diabetic retinopathy. This article aims to review important clinical features of diabetic retinopathy and provide some practical tools for improved screening with the direct ophthalmoscope.

When to start screening

- Type 1 diabetics generally do not develop retinopathy within 5 years of the diagnosis.
- Type 2 diabetics may have retinopathy before diabetes is diagnosed. They should be screened at the time of diagnosis.
- Pregnant diabetics should preferably be screened before pregnancy, early in the first trimester, in each trimester as well as 6 weeks postpartum.

How often to screen

- Annual screening is recommended.
- Complications are extremely unlikely. The importance of the visual acuity test is that maculopathy can be difficult to diagnose in some patients. Unexplained visual acuity of 6/12 or worse may indicate maculopathy even if not obvious on examination and should be referred.

Step 2: Dilate the pupils

Is it always safe to dilate the pupils?

Short-acting dilating drops are extremely unlikely to cause ocular complications. We would recommend Mydriacyl (tropicamide) which lasts up 6 hours. One drop is instilled 3 or 4 times in each eye at 5-minute intervals.

Step 3: Examine the ‘red reflex’

This is done by examining the red reflection of light emerging from the eye with the ophthalmoscope held about 50 cm from the patient. Both eyes should be examined and compared.

Interpretation of abnormal red reflex:
- Discrete small black areas: media opacities – most likely early cataract, sometimes corneal in origin.
- Diffusely dull or no reflex: severe media opacity or disrupted anatomy – possible vitreous haemorrhage or retinal detachment. These will be accompanied by severe visual loss. Visualisation of the fundus may not be possible.

Step 4: Fundus examination

Pearls for the use of the direct ophthalmoscope:
- Examine the patient’s right eye with your right eye, and left eye with your left eye. The index finger should be on the focus wheel at all times. If you are examining
the patient with your glasses on (distance correction) then start on zero with the ophthalmoscope. If you remove your glasses, start with your refractive error (for example -2.00 is usually a red 2 on the dial). Actively seek a good focus on the patient's retina by rotating the focus wheel during examination.

- Make sure that you are holding the ophthalmoscope close enough to your own eye and close enough to the patient's eye. Think of trying to look through a keyhole into a room. You must get close enough. Your free hand can be placed on the patient's forehead to help you judge your distance from the eye and your thumb can gently lift the eyelid.
- If the pupil is widely dilated then use the largest light. If the pupil fails to dilate well then the largest light creates more scatter and a smaller one may improve visualisation. Dimming the ophthalmoscope light slightly may make the patient more comfortable and co-operative.
- Ask the patient to look directly at the light to bring the macula (fovea) into view. Use the 'red-free' (green) filter on the ophthalmoscope to help identify small haemorrhages, particularly at the fovea.

### Table 1. Systematic examination and possible findings

<table>
<thead>
<tr>
<th>Structure examined</th>
<th>Possible features of diabetic retinopathy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optic disc</td>
<td>New vessels (new vessels at the disc – NVD) (Fig. 7) All new vessels (NVD and new vessels elsewhere – NVE) have an appearance very different from the typical branching, tapering vessels of the normal retina. They are 'out of place', often forming looped random networks</td>
</tr>
<tr>
<td>Major vessels in 4 quadrants</td>
<td>Venous tortuosity/irregularity New vessels (NVE)</td>
</tr>
<tr>
<td>Peripheral areas between vessels</td>
<td>Microaneurysms Haemorrhages: 'dot' and 'blot' (Fig. 6) Larger 'blot' haemorrhages are a feature of more severe retinopathy, particularly if they occur in all four quadrants of the retina Exudates (yellow, discrete deposits or large clumps) Cotton wool spots (pale with blurred edges – Fig. 5) New vessels (NVE)</td>
</tr>
<tr>
<td>Macula</td>
<td>Exudates Haemorrhages Cotton wool spots: Any pathology in the macula is significant and should be referred. Pathology within 1 disc diameter of the centre of the fovea is particularly significant (Fig. 3b)</td>
</tr>
</tbody>
</table>
Grading retinopathy

<table>
<thead>
<tr>
<th>Grading</th>
<th>Clinical signs</th>
<th>Examples</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal eye</td>
<td>No retinopathy</td>
<td>Fig. 4 Mild NPDR</td>
<td>Review in 1 year</td>
</tr>
<tr>
<td>Mildly ischaemic eye</td>
<td>Occasional microaneurysms</td>
<td>Fig. 5. Moderate NPDR</td>
<td>Refer</td>
</tr>
<tr>
<td>Moderately ischaemic eye</td>
<td>Dot haemorrhages</td>
<td>Fig. 6. Severe NPDR</td>
<td></td>
</tr>
<tr>
<td>Severely ischaemic eye</td>
<td>Hard exudates</td>
<td>Fig. 7. Proliferative DR</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cotton wool spots</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PLUS</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Larger (blot) haemorrhages</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Venous beading /irregularity</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PLUS</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>New vessels at the disc (NVD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>New vessels elsewhere (NVE)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NPDR = non-proliferative diabetic retinopathy; DR = diabetic retinopathy.
Diabetic retinopathy

- Be proactive about the retinal examination. Ask the patient to look in different directions. When the patient looks up, drop your head and look upwards to view the superior peripheral retina etc.

Fig. 1 shows a normal fundus. Assessment of the fundus should be systematic (Fig. 2). One should grade the level of retinopathy and look for maculopathy separately.

The optic disc is a good starting point and serves as a reference location. Look particularly for the features listed in Table 1 at each location.

The flow diagram will help to identify the degree of retinopathy present and indicates when referral is necessary.

How urgently should patients be referred to an ophthalmologist?

Proliferative diabetic retinopathy should be seen within 1 - 2 weeks. Moderate to severe non-proliferative retinopathy or maculopathy should be seen within 1 - 2 months.

Treatment by the ophthalmologist

Laser treatment has been the cornerstone of treatment for diabetic retinopathy. This remains the case for proliferative retinopathy. Anti-vascular endothelial growth factor (anti-VEGF) agents and some steroid preparations are new and effective treatments for some cases of macular oedema.

White scar tissue

New vessels grow on a scaffold of tissue which eventually thickens to form tight scars. These contract and cause a tractional retinal detachment. These patients have proliferative diabetic retinopathy (Fig. 9).

Signs of previous treatment

Some patients have had laser treatment of their retinopathy (Fig. 10). Predominantly black scarring occurs. If the patient has been referred to you by an ophthalmologist as stable following treatment, then annual fundoscopy is indicated. If there is uncertainty about the stability of the retinopathy the patient should be referred.

References


In a nutshell

- Appropriate screening and referral for diabetic retinopathy will prevent blindness.
- Screening involves visual acuity, pupil dilation and fundus examination.
- The degree of retinopathy and maculopathy should be assessed independently.
- Patients with mild non-proliferative retinopathy and no maculopathy should be screened annually.
- Refer diabetic patients with any of the following:
  - visual acuity 6/12 or worse of uncertain cause (suspected maculopathy)
  - diabetic maculopathy
  - moderate diabetic retinopathy or worse.