Preserving vision in diabetes

A quick reference guide for optometrists, nurses and other health practitioners

June 1997

This document is a general guide to appropriate practice, to be followed only subject to the professional's judgement in each individual case.

The guidelines are designed to provide information assisted decision-making and are based on the best possible information at the time of publication.

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ISBN 0642272360

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Publications approval number: 2139

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The production and distribution of these guidelines were funded under the National Diabetes Strategy.

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About this quick reference guide

This document contains information drawn from the *Clinical practice guidelines for the management of diabetic retinopathy*—a set of clinical practice guidelines developed by the National Health and Medical Research Council (NHMRC). The original guidelines and modified versions titled *Management of diabetic retinopathy: a guide for general practitioners* and *Diabetes and your eyes: a consumer guide for the management of diabetic retinopathy* have all been developed by an NHMRC Working Party with representatives from ophthalmology, optometry, endocrinology, general practice, the nursing profession, the consumer movement and Aboriginal and Torres Strait Islander people.

The consumer guide `Diabetes and your eyes` is available from national and State/Territory offices of Diabetes Australia.

Should you wish to obtain further copies of the clinical practice guidelines, they can be obtained by contacting:

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Introduction

Diabetic retinopathy is common. In Australia, it is present in nearly one third of people with diabetes, and threatens vision in 10 per cent. Among those with no retinopathy, 10 per cent will develop it each year. Compared to the general population, people with diabetes have about a 25–fold risk of blindness.

But visual loss can be prevented in almost all cases, provided the retinopathy is identified early. This requires regular eye screening for all people with diabetes.

This booklet will help you to:

- **prevent and screen** for diabetic retinopathy in all patients with diabetes;
- **identify when patients should be referred** for specialist ophthalmic management; and
- **understand and support** specialist treatment and follow-up for patients with diabetic retinopathy.

Checklist

Preserving vision in diabetes

All people with diabetes are at risk of vision loss or blindness due to diabetic retinopathy.

Minimise the risk of diabetic retinopathy:

- **Strict glycaemic contro**l is vital.
- Manage serum lipids and elevated blood pressure.

Detect early changes:

- **Measure visual acuity and examine fundi at least every two years** from the time of diabetes diagnosis.
- **Re-examine** every year if minimal changes are detected.
- **Refer to an ophthalmologist**
  - if vision is reduced or has changed, or
  - if retinal changes are more than minimal.

Refer urgently if there is any change near the macula.

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1. Diabetic retinopathy is…

Diabetic retinopathy may be defined as typical retinal signs in a person with diabetes mellitus. It is characterised by the gradual progression of signs (each of which may be present individually in other disease processes) and is considered in two stages:

Non-proliferative diabetic retinopathy (NPDR)

NPDR is the earliest stage visible with the ophthalmoscope. It is characterised by:

- **microaneurysms**: small round red dots in the retina which are saccular dilatations of capillaries;
- **haemorrhages**: in the retina, which may have a dot, blot or flame appearance;
- **hard exudates**: well defined, irregular, yellowish deposits (lipid and fibrin), often at the margin of oedematous retina, and derived from leaking capillaries;
- **cotton wool spots**: ill-defined white patches that are microinfarcts within the retinal nerve fibre layer;
- **venous beading**: irregular calibre changes in the retinal veins; and
- **intraretinal microvascular abnormalities (IRMA)**: visible dilated capillaries in the retina, bridging arterioles and venules, which indicate capillary non-perfusion.

Macular oedema

Macular oedema is the commonest cause of decreased vision in diabetic retinopathy. It:

- can occur at any stage;
- is caused by leakage from or loss of macular or perimacular capillaries; and
- is indicated by a finding of microaneurysms, haemorrhages or hard exudates near or within the macula.

It is categorised as **'clinically significant macular oedema'** (known as CSME) when retinal thickening or hard exudates are within 500 micrometres of the macular centre (one third of the diameter of the optic disc).

Proliferative diabetic retinopathy (PDR)

PDR is characterised by growth of **new vessels** and fibrous tissue which can cause:

- **vitreous haemorrhage**; and/or
- bands of fibrovascular scar tissue that can cause traction on the retina and lead to **tractional retinal detachment.**

Either of these can cause blindness.

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2. Risk factors and prevention

- **Risk of retinopathy increases progressively** each year from time of diagnosis of diabetes.
- **Strict glycaemic control is the most important factor** in the prevention of both the development and progression of retinopathy. The causal relationship between blood glucose control and retinopathy has been unequivocally shown in multiple randomised controlled trials.
- **Aim to manage serum lipids**. Elevated serum cholesterol is associated with increased risk of retinal hard exudates, and is an independent risk factor for visual impairment.
- **Aim to control hypertension**. There is also evidence to implicate hypertension, pregnancy, and nephropathy in the development and progression of diabetic retinopathy.

3. Retinopathy and diabetes type

Two main types of diabetes mellitus are recognised:

- **Insulin-dependent diabetes mellitus**—about 10 per cent of diabetes. Onset usually before age 30 but can occur at any age; characterised by absolute insulin deficiency and prone to ketosis. Always requires insulin treatment.
- **Non insulin-dependent diabetes mellitus**—about 90 per cent of diabetes. Appears primarily after age 30 but can present at any age; can be asymptomatic for many years and often associated with obesity. Not prone to ketosis and often managed with diet alone or with oral hypoglycemics. 30 per cent of patients eventually require insulin treatment.

Retinopathy can occur in both types of diabetes.

Non insulin-dependent diabetes mellitus can be present undetected for many years, and retinopathy is already present in 10–15 per cent of people by the time their non insulin-dependent diabetes mellitus is diagnosed. Of these, some have vision-threatening retinopathy.

4. Screening for diabetic retinopathy

- **All patients with diabetes must have a dilated fundus (retinal) examination at least every two years**. This should start when the diabetes is first diagnosed. Examinations should be more frequent once any retinopathy is detected (see below). For children with diabetes the first exam may not be needed until puberty, although earlier exams may be appropriate for some children.
- **Visual acuity must also be tested** in each eye, at each screening examination, before dilatation.
- **Pupil dilatation is essential** for fundus examination. This can be achieved using tropicamide 0.5 per cent which is available in single-use packets.
- Screening may be carried out by GPs, physicians, optometrists and ophthalmologists. With suitable training and regular practice, sensitivity for the screening examination is achievable with a good specificity. Combined with regular screening, this will achieve an adequate overall level of detection.

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- Alternatively, screening may be carried out with a non-mydriatic retinal camera (ie capable of retinal photography without dilatation, although dilatation is often used for better photos). Photos require a trained reader. Approximately 10 per cent of photos are not usable.

Action

- If *minimal* retinopathy is detected (ie isolated microaneurysms only) but visual acuity is normal, referral to an ophthalmologist may not be needed, but *examinations must be repeated at least yearly.*
- *Refer routinely* to an ophthalmologist if *mild* retinopathy (ie any retinal haemorrhage, or any other retinopathy lesions) is detected. (Refer to table on page 10).
- *Refer as soon as possible* to an ophthalmologist:
  - if retinopathy is *moderate* (ie microaneurysms and haemorrhages plus any other sign) or *severe*;
  - if *visual acuity* in either eye is *reduced* or has *deteriorated*; and/or
  - if the *fundus cannot be adequately examined.*

(Refer to table on page 10)

Follow-up examinations by the ophthalmologist

Anything more than minimal retinopathy should be followed-up by the ophthalmologist:

- every 6–12 months for mild retinopathy; and
- every 3–6 months for moderate, severe or proliferative retinopathy.

Optometrists and GPs should check with their patients that this is occurring.

Is pupil dilatation safe?

Pupil dilatation is very safe. It causes blurring of near vision for an hour or two, but driving is normally safe. Glare will be more noticeable, and sunglasses will help. Acute angle closure glaucoma and other side effects are extremely rare.

Benefits of screening

- Early laser treatment leads to a seven-fold reduction in risk of visual loss due to proliferative diabetic retinopathy, and at least halves the risk of visual loss due to macular oedema.
- Intensification of glycaemic control and reduction of other risk factors bring additional benefits in reducing progression of diabetic retinopathy.

With early detection and adequate treatment, up to 98 per cent of severe vision loss (bilateral blindness) can be prevented.

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5. Fluorescein angiography to assess retinopathy

Indications

- Fluorescein angiography is most useful when macular oedema is present, to identify sources of perimacular leakage and to guide focal and grid laser treatment of the retina.
- It may also be used to detect ischaemic maculopathy, to investigate unexplained visual loss, or to determine the source of vitreous haemorrhage if new vessels are suspected but cannot be seen.
- It is not appropriate to use fluorescein angiographs as a screening tool, as it is invasive and carries a risk.

The procedure

Fluorescein angiography requires an intravenous injection of sodium fluorescein solution. Photographs are taken using a fundus camera with special filters.

Side effects

Most frequent side effects are nausea for a few minutes, with occasional vomiting and urticaria. The urticaria may be delayed, and is helped by antihistamines. Skin is yellowed for some hours and urine is bright yellow for a day or more. More serious side effects are rare, but include myocardial infarction, asystole or death. Resuscitation equipment should always be available when fluorescein angiography is conducted.

6. Laser treatment (photocoagulation)

The procedure

- Focal or grid laser treatment is the use of small spot-sized laser burns to treat areas of leakage in the perimacular area, identified by fluorescein angiography.
- Panretinal laser treatment is application of laser burns to retinal areas outside the macular area. This is the principal treatment for proliferative retinopathy (PDR) and is usually applied in more than one treatment session.

Benefits

There is strong evidence from randomised controlled trials that:

- in people with PDR, panretinal laser treatment can reduce risk of severe visual loss by up to 98 per cent; and
- in people with CSME, focal or grid laser treatment can more than halve the risk of moderate visual loss.

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Guidelines

- For high risk PDR, panretinal laser treatment should be performed as soon as possible. For earlier stages of PDR, it should be done after any signs of maculopathy are stabilised.
- For CSME, focal or grid macular laser treatment should be considered. Where the oedema does not meet CSME criteria, laser treatment may be deferred, depending on progression of signs, the fellow eye, or ability to follow-up closely.
- For eyes with both PDR and CSME but without high-risk PDR, focal or grid macular laser treatment should be completed before panretinal laser treatment is performed.
- For less severe retinopathy, the benefits of laser treatment should be balanced against the small risk it carries of damage to vision. These patients should be carefully monitored for signs of vision-threatening retinopathy.
- After laser treatment, patients should be reviewed closely and regularly. Further laser treatment may be needed if high-risk characteristics re-develop or fail to regress.

Side effects and complications

Some people experience discomfort or pain during panretinal laser treatment and may require peribulbar anaesthesia.

After treatment, vision may be blurred for days or weeks. Sometimes exacerbation of macular oedema can cause longer term visual reduction, but this can be minimised by treating the oedema before treating PDR. There is a slight risk of damage to the macula from inadvertent foveal laser treatment or from subsequent migration of laser treatment scars.

People with retinopathy are often more sensitive to glare and have difficulty with light-dark adaptation. These effects may increase after laser treatment.

7. Vitrectomy surgery

The procedure

Vitrectomy is performed through the sclera to:

- remove vitreous haemorrhage; and/or
- relieve traction retinal detachment by excising fibrous or vitreous traction bands.

At times during retinal detachment surgery an inert gas or silicone oil may be injected into the eye to provide retinal tamponade.

Indications

Where possible, panretinal laser treatment should be attempted before vitrectomy is considered. Vitrectomy should be considered:

- for insulin-dependent diabetes mellitus patients with severe vitreous haemorrhage in eyes known or suspected to have very severe PDR. The benefits are less for non insulin-dependent diabetes mellitus patients;

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- for eyes with severe PDR that are not responding to aggressive and extensive panretinal laser treatment; and
- to relieve macular or other retinal traction in advance PDR in an attempt to salvage some vision.

Side effects and complications

These may be significant. Vitreous haemorrhage may occur in the short term. Significant cataract occurs in 20–25 per cent of eyes within 6 months. Other complications include: neovascular glaucoma; epiretinal membrane formation with macular scarring; and, rhegmatogenous retinal detachment.

Outcome

Five to 10 years after vitrectomy, more than 40 per cent of patients maintain stable and useful visual acuity. Those with good short-term results after surgery tend to remain stable.

8. Aspirin and other agents

- Aspirin is safe for use in patients with diabetic retinopathy, when indicated for other reasons, but it confers no benefit for retinopathy.
- No other antiplatelet agent or specific oral hypoglycaemic has been shown in multicentre trials to influence the development or progression of diabetic retinopathy.

9. Cataract and retinopathy

There is a well documented association between diabetes and early onset of cataract, particularly for cortical and posterior subcapsular cataract. In addition, diabetes may significantly worsen the visual outcome after cataract surgery.

Cataract surgery may accelerate the development of retinopathy in eyes with pre-existing untreated retinopathy, or may initiate development of rubeosis iridis (ie formation of new vessels of the surface of the iris) or neovascular glaucoma.

Before cataract surgery:

- Current opinion recommends adequate laser treatment of significant retinopathy.
- Where possible, macular oedema or threatened maculopathy should be treated with focal or grid laser. Consideration should be given to delaying cataract surgery until retinopathy and macular oedema are stabilised.

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10. Classification and referral recommendations

A consultation with an ophthalmologist should be arranged within one month if best

Classification	Clinical signs	Referral recommendations
Minimal NPDR*	Isolated Microaneurysms only (Ma).	Referral may not be needed. Review annually with dilated fundus exam.
Mild NPDR*	Microaneurysms (Ma) + retinal haemorrhages (H).	Routine referral to an ophthalmologist. 6 monthly reviews with ophthalmologist to follow.
Moderate NPDR*	Haemorrhages and microaneurysms (HMa) in at least 1 quadrant + cotton wool spots (CWS) or venous beading (VB).	Refer to an ophthalmologist as soon as possible. 3–6 monthly reviews with ophthalmologist to follow.
Severe NPDR*, PDR#	Intraretinal microvascular abnormalities (IRMA) in 1 or more quadrants, venous beading (VB) in 2 or more quadrants, and haemorrhages/ microaneurysms (HMa) in all 4 quadrants.	Refer to an ophthalmologist urgently. 3–6 monthly reviews with ophthalmologist to follow.
High risk PDR#	New vessel growth covering an area greater than $^1/_3$ of disc area or with vitreous/pre-retinal haemorrhage	Refer to an ophthalmologist urgently. 3–6 monthly reviews with ophthalmologist to follow.

corrected visual acuity in either eye is reduced, when compared to any previous examination, by one line of letters or more or if the fundus cannot be adequately examined.

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*NPDR = non-proliferative diabetic retinopathy (equals background diabetic retinopathy).
PDR = proliferative diabetic retinopathy (equals pre-proliferative diabetic retinopathy).

Macular oedema

Type	Clinical signs	Referral recommendations
Clinically Significant Macular Oedema (CSME) Sight threatening Impending CSME	Retinal thickening or hard exudates within 500µm of macular centre ($^{1}/_{3}$ diameter of optic disc).	Refer to an ophthalmologist urgently.
	Microaneurysms, haemorrhages or hard exudates near or within the macula but >500µm from macular centre.	Refer to an ophthalmologist as soon as possible.

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