



Game changers in type 2 diabetes

The implications of panretinal laser therapy

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Panretinal laser therapy, an effective treatment for sight-threatening diabetic retinopathy, should prompt a major review of diabetes management because retinopathy suggests that other microvascular disease is present, and probably macrovascular disease as well.

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Panretinal laser therapy is an important part of the management of diabetic retinopathy but the need for the procedure may be a game changer for diabetes management and the procedure itself is often a life-changer for the patient. Both the diabetes health professional team and the patient are confronted with the reality of visual loss, the potential of future visual loss and blindness, and the virtual certainty of severe microvascular disease in other systems of the body (neuropathy and nephropathy) as well as the likelihood of macrovascular disease (atherosclerotic cardiovascular disease).

This article discusses the implications of requiring and having panretinal laser therapy for proliferative diabetic retinopathy. It is the first in a series of articles reviewing clinical situations that indicate a major change in the level of risk of diabetes-related complications and prompt the need for a major review of diabetes management. Some background information on retinopathy and panretinal photocoagulation is given in the box on page 56.¹

IMPLICATIONS OF HAVING LASER PHOTOCOAGULATION

Visual loss after laser therapy

After panretinal laser therapy, the retina is covered with white blots of ischaemic retina, as shown in Figure 1. It is amazing that

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DIABETIC RETINOPATHY AND PANRETINAL PHOTOCOAGULATION

Diabetic retinopathy

In the early stages of diabetic retinopathy, microaneurysms and small haemorrhages of the retinal arterioles occur and then retinal vessels become blocked, depriving areas of the retina of a blood supply. Visual symptoms are not normally experienced in this nonproliferative retinopathy.

As the retinopathy progresses, the retinal ischaemia causes the production of growth factors, including vascular endothelial growth factor, that stimulate the growth of fragile abnormal retinal vessels – proliferative retinopathy. As these vessels grow, the patient becomes at risk of visual loss due to haemorrhage into the vitreous and/or retinal detachment.

Panretinal photocoagulation

Panretinal, or scatter, photocoagulation is able to destroy ischaemic retinal tissue, and thereby stop the neovascularisation. In the absence of growth factors, the new vessels generally regress and may disappear.

The procedure of panretinal laser therapy involves the placing of multiple laser burns (up to 2000) over the entire retina, avoiding the macula. The treatment is not applied directly to neovascularisation of the optic disc and generally not to neovascularisation elsewhere. A common complication is exacerbation of macular oedema if it is present. Also, because the laser therapy destroys viable retinal tissue, it can cause peripheral visual field defects, reduced night vision, diminished colour vision and decreased contrast sensitivity.

Despite the small risk of some immediate visual loss, timely laser photocoagulation is an effective therapy for sight-threatening diabetic retinopathy.¹ It should be performed as soon as possible for high-risk proliferative retinopathy and when any maculopathy is stabilised in earlier proliferative retinopathy, and be considered for severe nonproliferative retinopathy; for less severe retinopathy, the benefits need to be balanced against the risks.¹

the eye can see anything at all but usually central macular vision is preserved (recognition of colour and perception of details) although peripheral vision may be lost or severely impaired, especially in dim light.

Loss of visual capacity may mean that people are no longer safe to drive, especially at night. They may also not be safe in the dark if they have the additional microvascular complication of neuropathy, which reduces their proprioception. When they are in dim light conditions or in the dark, they are totally dependent on their vestibular system to inform the brain of body position, and therefore they may have difficulty maintaining their balance and may possibly fall.

These visual limitations may threaten

a person's capacity to live or function independently, and also their employment. Such losses may be overwhelming and profoundly disorienting and depressing. And once these visual threats are dealt with, there are other threats to be confronted.

Proliferative diabetic retinopathy rarely affects one eye and leaves the other untouched. One eye may be more affected than the other but severe retinopathy will be present in both eyes, and both will need laser therapy, resulting in bilateral loss of peripheral and night vision. The Diabetic Retinopathy Study (DRS) established the value of laser therapy for proliferative diabetic retinopathy by comparing the visual outcomes in patients with bilateral proliferative retinopathy

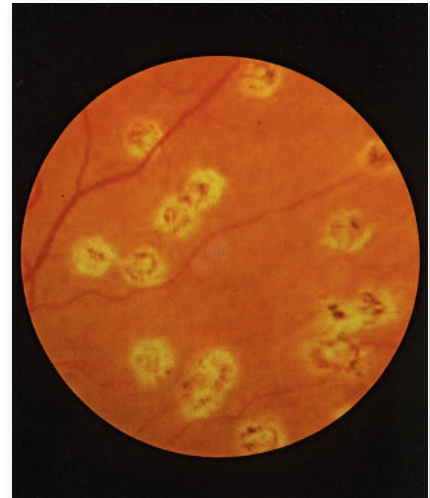


Figure 1. The retina after panretinal laser therapy for proliferative diabetic retinopathy.

who had one eye treated while the other acted as a control (treatment was deferred in the control eye).^{2,3} The trial demonstrated a clear benefit of early laser therapy, with reduction in the incidence of severe visual loss (Figure 2).

However, although laser therapy decreases visual loss compared with the untreated eye, vision continues to decline, causing severe visual loss within a relatively short time in many patients.

IMPLICATIONS OF REQUIRING LASER PHOTOCOAGULATION

Widespread severe microvascular disease

In a person with severe diabetic retinopathy, severe microvascular disease is likely to be present throughout the body – most notably in the kidneys and nerves but also in other organs, such as the heart. Nephropathy is associated with albuminuria, rising plasma creatinine levels and a series of 'vicious cycles' linked to cardiovascular disease.⁴ Neuropathy is associated with loss of protective sensation in the periphery and changes in the structure and function of the feet, both of which make foot problems more likely.

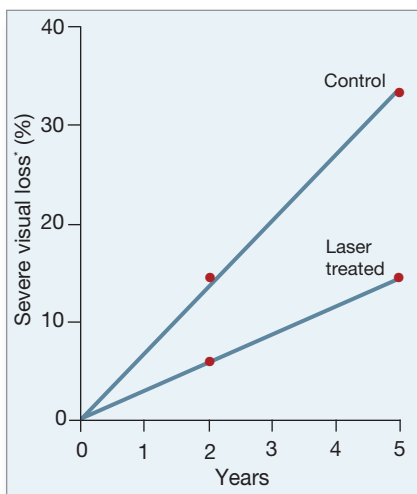


Figure 2. Results of the Diabetic Retinopathy Study (DRS) showing benefit of panretinal laser therapy.^{2,3} (Severe visual loss was defined in the DRS as visual acuity $\leq 20/800$; in Australia, this is equivalent to $\leq 6/240$.)

Probable macrovascular disease

Type 2 diabetes itself is associated with increased cardiovascular risk and risk factors for diabetic retinopathy include hypertension, dyslipidaemia and smoking, all of which are risk factors for cardiovascular disease as well.¹ Severe diabetic retinopathy suggests that these risk factors had not been well controlled and that widespread macrovascular disease may be present. As noted, cardiovascular risk would be further increased if nephropathy were also present.

ASSESSING AND RESPONDING TO THESE IMPLICATIONS

Visual loss

Ophthalmologists will almost certainly assess a patient who has undergone laser therapy for diabetic retinopathy for visual limitations and capacity to cope with dark environments and driving. Counselling, arranged by the ophthalmologist or GP, is important in enabling patients to cope with these limitations.

The providing of counselling by a person familiar with the potential problems and possible solutions can minimise any limitations and help the patient cope with an uncertain future. Specialist psychological support will also help the patient adjust to the situation, and cognitive behavioural therapy will provide skills to cope with future challenges. The partner, family and any carer might also value advice about their role in helping the patient live with their limitations. Further information may be obtained from Vision Australia (<http://www.visionaustralia.org.au>) and, in South Australia, The Royal Society for the Blind (<http://www.rsb.org.au>).

Widespread microvascular and probable macrovascular disease

Assessment of micro- and macrovascular disease includes establishing the extent of disease and damage and any uncontrolled risk factors for future problems. Indicators include a past history of myocardial infarction or angina, transient ischaemic attack or stroke, and claudication. Some investigations are suggested in the box on this page, and the advice of specialist colleagues may be useful.

Reviewing the major targets in managing type 2 diabetes, the ABCs of diabetes care (glycosylated haemoglobin [A_{1c}], Blood pressure, Cholesterol level and smoking), would identify any specific risk factors that should be addressed in a

INVESTIGATIONS FOR MICROVASCULAR AND MACROVASCULAR DISEASE

Suspected microvascular disease

- Nephropathy: plasma creatinine and estimated glomerular filtration rate (eGFR); urinary albumin-creatinine ratio (ACR) or albumin excretion rate (AER)
- Neuropathy: peripheral sensation, reflexes and power
- Cardiac: echocardiogram

Suspected macrovascular disease

- Coronary: ECG; exercise stress test
- Cerebral: carotid ultrasound
- Peripheral: ankle brachial pressure indices

patient with diabetes, remembering that recommended targets for such patients with existing nephropathy or coronary disease are lower (Table 1).⁵ Both GPs and patients are probably prepared to invest time and effort in these assessments, and patients are probably also committed to intensifying therapy and coming as close as possible to the general targets of diabetes care.

Particular problems may be identified by the clinical history, examination and investigations. Suggested responses to these include:

TABLE 1. THE ABCS OF DIABETES CARE^{5*}

Factor	Target
A – Glycosylated haemoglobin (A_{1c})	<7.0%
B – Blood pressure	<130/80 mmHg
C – Cholesterol	<4 mmol/L
s – Smoking	0

* A further 's' (salicylate therapy) in the original ABCs is no longer routinely recommended for those people with diabetes and no known cardiovascular disease.

COMMON CONTRIBUTORS TO NEPHROPATHY
<ul style="list-style-type: none"> • Urinary tract infection • Urinary obstruction • Current or previous nephrotoxic medication – e.g. NSAIDs, radiographic contrast media, aminoglycoside antibiotics • Renovascular disease (arterial and venous)

COMMON CONTRIBUTORS TO NEUROPATHY
<ul style="list-style-type: none"> • Alcohol • Entrapment neuropathy • Vitamin B₁ deficiency • Hypothyroidism • Neurotoxic medication – e.g. nitrofurantoin, statins, vinca alkaloids (chemotherapy)

- nephropathy – assess for other contributors to nephropathy (see the box on this page)
- neuropathy – assess for other contributors (see the box on this page), and assess the other risk

factors for foot problems requiring more intensive foot care and specialised footwear (i.e. foot sensation and circulation, routine foot care and abnormal foot structure)

- cardiac dysfunction – consider referral to a cardiologist
- coronary artery disease – consider referral to a cardiologist
- cerebrovascular disease – if significant (more than 70% occlusion) or symptomatic, consider referral to a neurologist or stroke physician
- peripheral vascular disease – as for neuropathy.

The foot factor ‘traffic light’ guide is a quick way to assess foot risk (the ABCS of foot risk: Anaesthesia, poor Blood flow, routine Care and abnormal Structure), as shown in Table 2.⁶ If all the traffic lights are green (normal), there is no excess risk or need for specialist podiatric input. If there are any amber or red lights, the patient should be referred promptly for specialist assessment and

TABLE 2. ASSESSMENT OF RISK FACTORS FOR FOOT PROBLEMS IN DIABETES: THE FOOT FACTOR TRAFFIC LIGHTS⁷

Foot factor traffic lights			
ABCS assessment	Red lights – ‘Danger’	Amber lights – ‘Caution’	Green lights – ‘Healthy’
Anaesthesia			
– Pinprick, light touch (e.g. 10 g monofilament)	No stimuli felt	Reduced stimuli	All stimuli felt
– Reflexes	No reflexes	Reduced reflexes	Normal reflexes
Blood			
– Pulse palpation	No pulses	Reduced pulses	Normal pulses
Care*			
– Questioning	– be better	Foot care and/or footwear could be better	Appropriate foot care and footwear
– Observation	Skin breakdown	Threatened skin breakdown	Normal skin
Structure			
– Observation	Weight-bearing ulcer	Callus or corn	No skin lesions
Patient risk assessment			
Traffic lights	Risk assessment		Recommended action
One or more ‘red lights’	High risk		Prompt referral to a podiatrist
One or more ‘amber lights’	Moderate risk		Regular podiatry care and assessment
All ‘green lights’	Low risk		General foot care advice
* Inadequate foot care in the absence of any other red or amber traffic lights is not a major risk factor for severe foot problems. Adequate foot care in the presence of one or more red or amber traffic lights is essential and can prevent severe foot problems.			

advice on footwear and foot care. Ongoing specialist podiatric nail care will be needed for patients with peripheral vascular disease and/or abnormally thickened or fungus-infected nails, as well as for those who cannot see or reach their nails.

CONCLUSION

Despite the small risk of some loss of peripheral and night vision, panretinal laser therapy is an effective treatment for sight-threatening diabetic retinopathy. It is a major life-changing event for the patient, and should prompt a series of life and health preserving measures by the diabetes health professional team because the presence of retinopathy suggests the presence of other microvascular complications of diabetes, and also probably macrovascular complications. The GP plays the key role in co-ordinating the multipronged assessment and multidisciplinary management to control complication risk factors and to minimise the impact of other diabetic complications. Shared care is clearly the best form of care in this situation. Some key points regarding panretinal laser therapy are given in the box on this page. **MT**

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PANRETINAL LASER THERAPY: KEY POINTS

- Panretinal laser therapy is effective in patients with diabetic retinopathy that is threatening sight, although it may itself cause some visual loss.
- Counselling and support may help the person to deal with visual losses and their effects on daily functioning and work, and to cope with future losses.
- The existence of one severe microvascular complication should prompt review of the general risk factors for diabetes complications (the ABCs) and a check for the complications themselves and their severity.
- Efforts to reduce the future impact of microvascular and macrovascular diabetic complications include controlling complication risk factors, assessing the risk of future adverse events (e.g. the ABCS of foot risk) and responding to these risks.

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COMPETING INTERESTS: Dr Phillips has

