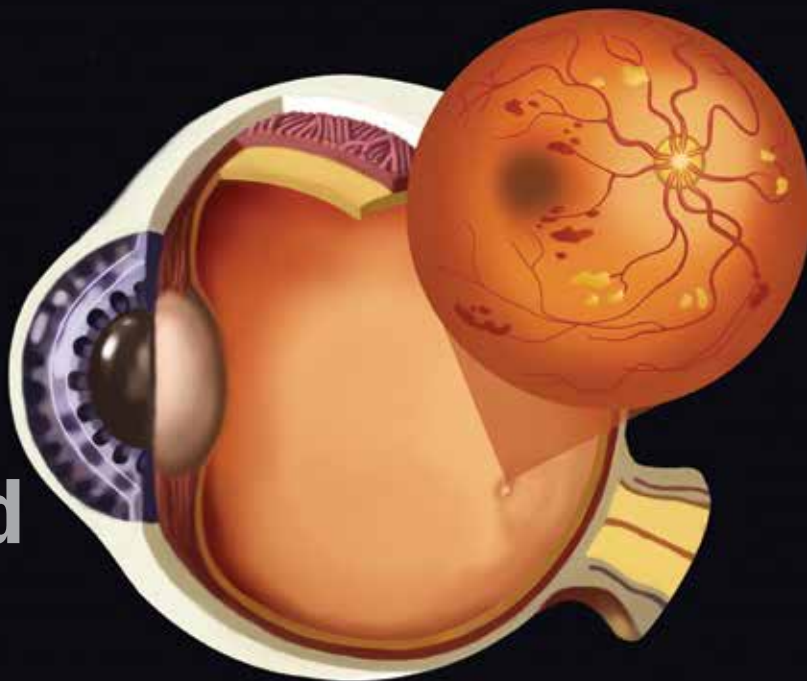


Hypertension and the eye

Implications and manifestations

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The finding of hypertensive changes in the eyes may have important implications for a patient's ocular and general health.

Hypertension is the most common modifiable risk factor for cardiovascular disease, present in a third of the adult Australian population. In the eye, hypertension causes narrowing in the retinal arteriole walls, arteriovenous nicking, retinal haemorrhages and soft exudates (Figures 1 and 2). In severe cases where there is optic disc swelling, patients have malignant hypertension, which may be associated with encephalopathy and cardiac and renal failure. Malignant hypertension is a hypertensive emergency requiring urgent treatment of the patient to reduce organ damage and vision loss (Figure 3).

What is the significance of hypertensive changes in the retina for general health?

The importance of finding hypertensive changes in the retina is that the retinal vessels are similar to small vessels in the brain and kidneys. Thus, retinal microvascular abnormalities are representative of cerebral microvascular abnormalities.¹

Studies show that retinal microvascular abnormalities are common, occurring in 2 to 15% of adults aged over 40 years. Some patients are more prone to developing retinal signs, and this is independently associated with an increase in cardiovascular disease and death.

The Atherosclerosis Risk in Communities Study and the Blue Mountains Eye Study both examined retinal photography and their correlation with health outcomes. After adjusting for cardiovascular risk factors (mean arterial blood pressure;

age; sex; race; antihypertensive medication; diabetes status; smoking; and cholesterol, lipid and fasting glucose levels), the presence of a microaneurysm or soft exudates was shown to carry a two to three times increase in the relative risk of stroke, coronary artery calcification and death.² This suggests that these retinal findings are not simply manifestations of underlying cardiovascular disease, but indicate that an individual has a higher cardiovascular risk than would otherwise be expected (Table 1).

Should all patients with hypertension have an ocular examination?

Australian guidelines recommend that patients have an ocular examination as part of the assessment of hypertension, to look for end organ damage.³ There is insufficient evidence, however, to recommend referral for a routine ophthalmic



Figure 1. Arteriovenous nicking (arrow), microaneurysms and dot haemorrhages.

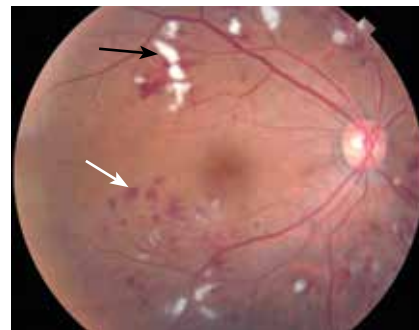


Figure 2. Blot haemorrhages (white arrow) and soft exudates (black arrow).

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Figure 3. Disc swelling and macular oedema in a patient with malignant hypertension.

examination to detect retinopathy in every patient with hypertension.² Studies have not been performed to show that intervening in patients with retinal findings would lower their risk; however, referral is recommended for the following groups:

- patients with grade 3 hypertension (systolic blood pressure ≥ 180 mmHg and/or diastolic blood pressure ≥ 110 mmHg), as the finding of moderate or greater retinopathy may prompt more aggressive therapy
- those with other cardiovascular risk factors – e.g. patients with subclinical stroke (white matter lesions on MRI) have a 3.4 times increased risk of stroke in the next five years, but if they also have moderate retinopathy this risk increases to 18.1⁴
- those borderline for antihypertensive drug treatment, as a finding of retinopathy may help make the treatment decision
- patients with diabetes, as diabetic retinopathy is more common and/or

severe in those who also have hypertension

- patients who have visual symptoms, as there may be a treatable cause of the visual impairment.

Which ocular conditions are associated with hypertension?

Hypertensive changes in the eyes lead to many ocular diseases. The signs and symptoms of some of these conditions are summarised in Table 2, and briefly described below.

Retinal artery occlusion

Patients with retinal artery occlusions present with sudden painless loss of vision. Fundoscopy shows a lack of flow in an arteriole and may show an embolus (Figure 4).

TABLE 1. CLASSIFICATION OF HYPERTENSIVE RETINOPATHY ²

Grade	Retinal signs	Systemic association
None	Nil	None
Mild	Arteriolar narrowing, arteriovenous nicking, ‘copper wiring’	Modest association with stroke, coronary heart disease and death
Moderate	Haemorrhage, microaneurysm, cotton-wool spot, hard exudates	Strong association with stroke, cognitive decline and death from cardiovascular causes
Malignant	Moderate retinopathy with optic disc swelling	Strong association with death

Modest association = relative risk or odds ratio 1 to 2.
Strong association = relative risk or odds ratio >2.

TABLE 2. SIGNS AND SYMPTOMS OF THE MORE COMMON OPHTHALMIC MANIFESTATIONS OF HYPERTENSION

Condition	Symptoms	Signs
Hypertensive retinopathy	Blurred vision	See Table 1
Macroaneurysm	Sudden loss of vision, floaters	Vitreous and retinal haemorrhage
Retinal vein occlusion	Sectoral or complete reduction of vision	Retinal haemorrhage, oedema
Retinal artery occlusion	Sectoral or complete reduction of vision	Retinal embolus, oedema, cherry red spot
Exacerbation of diabetic retinopathy	Blurred vision	Dot and blot haemorrhages, proliferative neovascularisation
Nonarteritic anterior ischaemic optic neuropathy	Sectoral field loss	Unilateral swollen optic disc, retinal haemorrhage
Isolated cranial nerve palsy	Diplopia, sudden ptosis, anisocoria	Abnormal eye movements, abnormal head posture



Figure 4. Inferior branch retinal artery occlusion. Note the whitening of the retina and narrowing of the arterioles inferiorly. Embolus (black arrow) at optic disc.

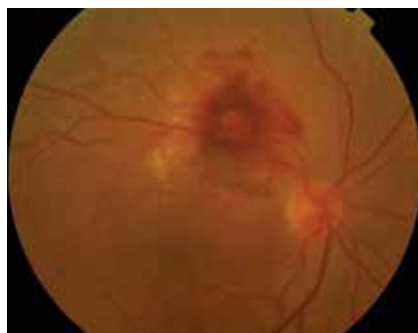


Figure 5. Macroaneurysm (focal dilation of a retinal arteriole).



Figure 6. Branch retinal vein occlusion. Arrow points to site of occlusion.

Macroaneurysm

Macroaneurysms are focal dilation of a retinal arteriole, which are often due to hypertension. They can leak, causing macular oedema, or bleed, causing vitreous haemorrhage. They can be treated with laser to stop further leakage or haemorrhage (Figure 5).

Retinal vein occlusion

Arteriovenous nicking refers to the compression of venules at points where arterioles and venules cross (Figure 6). This can cause a retinal vein occlusion resulting in haemorrhage, oedema and ischaemia.

Patients with retinal vein occlusion often present with a scotoma in their vision or a sudden loss of vision. The size of the scotoma will depend of the area of obstruction. Retinal vein occlusions can be complicated by the development of retinal neovascularisation, neovascular glaucoma and vitreous haemorrhage.

Retinal vein occlusions are treated with intravitreal antivascular endothelial growth factor agents, which reduce macular oedema and can significantly improve vision. Laser is also used to treat macular oedema and to treat the growth of abnormal vessels.

Worsening diabetic retinopathy

Diabetic retinopathy is exacerbated by hypertension: a 10 mmHg reduction in

systolic blood pressure reduces the risk of diabetic retinopathy progression by 11%.⁵

Nonarteritic anterior ischaemic optic neuropathy

Nonarteritic anterior ischaemic optic neuropathy (NAION) is an infarct of the optic nerve at the optic disc. The underlying cause is a mixture of structural issues (small crowded optic discs) and vascular risk factors.

Patients with NAION present with a scotoma and swollen optic nerve. There is no specific treatment, but optimising blood pressure and other cardiovascular risk factors are recommended to reduce the risk of a similar event in the other eye. Phosphodiesterase type 5 inhibitors, used in the treatment of erectile dysfunction, may be associated with NAION in predisposed patients.⁶ These medications should be avoided in patients who have had NAION.⁶

Isolated cranial nerve palsy

Diplopia can occur due to a cranial nerve palsy. A common cause is microvascular occlusion, associated with hypertension, diabetes and age. Cranial nerve palsies often improve significantly over a few months, although more serious causes of nerve palsy, such as a posterior communicating artery aneurysm, need to be excluded.

Conclusion

The finding of hypertensive retinopathy indicates that patients are at higher risk of

stroke and death than would be expected from their cardiovascular risk factors. Vision loss in patients with hypertension can be due to many causes and such patients should be referred for ophthalmic investigation. MT

References

- Cheung CY, Ikram MK, Sabanayagam C, Wong TY. Retinal microvasculature as a model to study the manifestations of hypertension. *Hypertension* 2012; 60: 1094-1103.
- Wong TY, Mitchell P. Hypertensive retinopathy. *N Engl J Med* 2004; 351: 2310-2317.
- National Heart Foundation of Australia (National Blood Pressure and Vascular Disease Advisory Committee). Guide to management of hypertension 2008. Updated December 2010. National Heart Foundation of Australia; 2010. Available from: <http://heartfoundation.org.au/images/uploads/publications/HypertensionGuidelines2008to2010Update.pdf> (accessed February 2016).
- Wong TY, Klein R, Sharrett AR, et al; ARIC Investigators. Atherosclerosis Risk in Communities Study. Cerebral white matter lesions, retinopathy, and incident clinical stroke. *JAMA* 2002; 288: 67-74.
- Stratton IM, Cull CA, Adler AI, Matthews DR, Neil HA, Holman RR. Additive effects of glycaemia and blood pressure exposure on risk of complications in type 2 diabetes: a prospective observational study (UKPDS 75). *Diabetologia* 2006; 49: 1761-1769.
- Pomeranz HD, Bhavsar AR. Nonarteritic ischemic optic neuropathy developing soon after use of sildenafil (Viagra): a report of seven new cases. *J Neuroophthalmol* 2005; 25: 9-13.

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