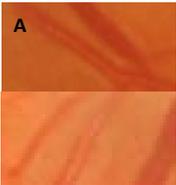


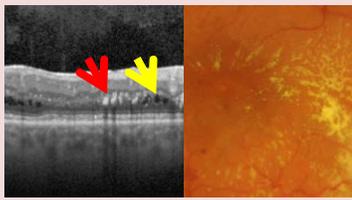
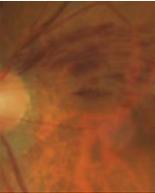
Hypertension is a chronic medical condition in which arterial blood pressure is elevated. It affects over 1 billion people worldwide, increasing in prevalence with age. It is one of the most important preventable risk factors for premature death, as it increases the risk of ischaemic heart disease, stroke, peripheral vascular disease, other cardiovascular disease and nephropathy. Grading schemes available for hypertensive retinopathy (Mitchell-Wong Scheme used below: Wong & Mitchell, New England Journal of Medicine, 2004;351(22):2310-7), but recent evidence suggests only a modest association between retinopathy and systemic organ damage.

## LESIONS OF HYPERTENSIVE RETINOPATHY

Vascular calibre changes (Mild retinopathy)		Retinal haemorrhages (Moderate retinopathy)		Category of hypertension	Systolic, mmHg	Diastolic, mmHg
<ul style="list-style-type: none"> <li>Thickening and loss of elasticity of the arterial wall</li> <li>Broadening of light reflex masking the blood vessel column, represents chronic arterial changes</li> </ul> <p><i>Copper vs. silver wiring (A)</i></p> <ul style="list-style-type: none"> <li>Changes start off as "copper wiring" (slight broadening of light reflex) (top)</li> <li>"Silver wiring" represents greater broadening of reflex (more "silver" within the vessel) (bottom)</li> <li>May be more useful to quantify broadening</li> <li>Can be focal or generalised</li> </ul> <p><i>A/V "nicking" (US) or "nipping" (UK) (B)</i></p> <ul style="list-style-type: none"> <li>Thickened arteriole can impinge upon the retinal veins, leading to potential vein occlusions (below)</li> <li>Salus's sign: Vein deflected by arteriole (yellow)</li> <li>Bonnet sign: Vein banked (course changed) (blue)</li> <li>Gunn sign: 90 degree vein banked and tapered (black)</li> <li>Note: arterial tortuosity is not typically expected due to stiffening, but banking may cause venous tortuosity</li> </ul>		<p><i>Flame haemorrhage</i></p> <ul style="list-style-type: none"> <li>Originate from superficial capillary bed or radial parapapillary capillaries</li> <li>Appearance due to RNFL orientation</li> <li>Resolves in around 6 weeks</li> </ul> <p><i>Dot/blot haemorrhage</i></p> <ul style="list-style-type: none"> <li>Originate from deep capillary bed (INL, ONL, or OPL)</li> <li>Displaces retinal structures, takes longer to resolve</li> </ul>		Normal	90-119	60-79
					High normal (prehypertension)	120-139
				Stage 1	140-159	90-99
				Stage 2	160-179	100-109
				<b>Stage 3 (hypertensive emergency)</b>	<b>≥180</b>	<b>≥110</b>
				Isolated systolic hypertension (may be normal in elderly)	≥140	<90

*Requires emergency referral to the patient's general practitioner and/or local hospital, whichever can provide the most urgent care*

## SEQUELAE OF HYPERTENSION IN THE EYE

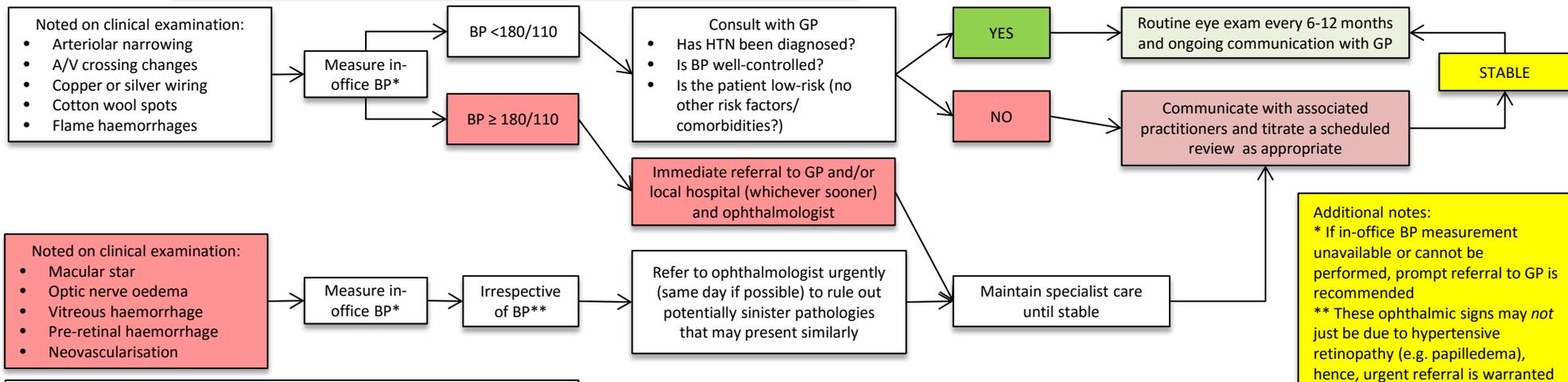
Hard exudates and macular oedema (Moderate retinopathy)		Optic neuropathy "hypertensive papillopathy" (Malignant retinopathy)	
<ul style="list-style-type: none"> <li>Compromised vessels in the macula leak lipids (hard exudates; hyper-reflective on OCT, red arrow) from the deep capillary bed, depositing in the OPL. Deposition within Henle's fibre layer forms a "macular star"</li> <li>Appear white-yellow waxy, with a glitter due to cholesterolin</li> <li>Leakage also produces macular oedema (hyporefective on OCT, yellow arrow)</li> </ul>		<ul style="list-style-type: none"> <li>In acute hypertension, vasoconstriction and choroidal ischaemia results in optic neuropathy and oedema (blue arrow) as a result of axoplasmic flow stasis, due to the lack of autoregulation of choroidal vasculature (this is because the ONH blood supply is through the short posterior ciliary arteries)</li> <li>In the chronic phase, the oedema resolves, leaving ONH pallor/atrophy</li> <li>Strongly associated with hypertensive emergency (BP: systolic ≥180 or diastolic ≥110, and should be managed as such)</li> </ul>	
Vascular occlusions/macroaneurysms		Choroidopathy (rare; follows acute hypertensive crisis: systolic >180 mmHg)	
<p><i>Vascular occlusions (right)</i></p> <ul style="list-style-type: none"> <li>Venous: due to impingement by thickened artery, intraretinally (branch occlusion) or posterior to lamina (central occlusion)</li> <li>Check for causative artery</li> </ul>		<p><i>Macroaneurysm (right)</i></p> <ul style="list-style-type: none"> <li>A localised dilatation of a retinal arteriole (saccular appearance)</li> <li>Gradual leakage of vessels compromises vision</li> <li>Appears as deep red haemorrhage +/-exudates</li> </ul>	
		<p><i>Elschnig spots (right)</i></p> <ul style="list-style-type: none"> <li>Changes in RPE due to choriocapillaris infarcts</li> <li>Appear as small, black atrophic spots, surrounded by yellow haloes</li> <li>Accelerated hypertension causes choroidal ischaemia</li> </ul>	<p><i>Siegrist streaks (right)</i></p> <ul style="list-style-type: none"> <li>Linear hyperpigmented streaks over choroidal arteries</li> <li>Indicative of fibrinoid necrosis, which then leads to fibrinous exudation</li> </ul>

Images unavailable, though note that the presence of these are typically accompanied by systemic symptoms and signs

Hypertension is a commonly seen and self-reported condition in optometric practice. In cases where there are signs of retinopathy, an optometrist should have the skills to screen blood pressure in their office, as part of the core competencies of the profession (Kiely & Slater. Clin Exp Optom 2014;98:65-89, Appendix 4: 3.8.1). The information below is intended as a guide for measurement of blood pressure status in an optometric practice, and should not be used as a replacement for cardiovascular assessment by a suitably trained general physician and/or cardiologist.

ESTABLISHING BLOOD PRESSURE STATUS IN YOUR OFFICE		TIPS FOR MEASURING BLOOD PRESSURE IN OFFICE	
<b>Entering medical history:</b> <ul style="list-style-type: none"> <li>• +/- hypertension</li> <li>• Any anti-hypertensive medications?</li> <li>• Any cardiovascular (DM, cholesterol) co-morbidities?</li> <li>• Other organ damage? E.g. kidney, heart</li> <li>• Obesity (BMI <math>\geq 30</math> kg/m<sup>2</sup>)</li> </ul>	<b>NOTE:</b> <ul style="list-style-type: none"> <li>• Optometric office screening of blood pressure should not be a replacement for evaluation by a trained general physician and/or cardiologist</li> <li>• Blood pressure taken at the arm is just one method for determining blood pressure, and does not exclude other cardiovascular diseases</li> <li>• Ongoing communication and comanagement with the patient's general physician is recommended</li> </ul>	<b>Equipment:</b> <ul style="list-style-type: none"> <li>• Check to make sure equipment working properly</li> <li>• Check against another model for accuracy</li> <li>• Check cuff size appropriate (bladder length should be approximately 80% of arm circumference (note manufacturer recommendation), especially if circumference &gt;30cm)</li> </ul>	
<b>Entering family history:</b> <ul style="list-style-type: none"> <li>• FHx of hypertension and/or cardiovascular co-morbidities</li> <li>• Cause of death of family members? (esp. if premature (&lt;60 years) death)</li> </ul>	<b>Cut-off blood pressure levels for referral to GP:</b> <ul style="list-style-type: none"> <li>• 140-159/90-99: routine referral</li> <li>• 160-179/100-109: within 2 weeks</li> <li>• <math>\geq 180/110</math>: emergency referral</li> </ul>	<b>Patient:</b> <ul style="list-style-type: none"> <li>• Patient should be well-rested and comfortable prior to exam</li> <li>• Patient should be seated straight, feet on the ground, with arm supported at heart level</li> <li>• Similar to blink rate, consider performing blood pressure whilst engaging in relaxing activities</li> </ul>	
<b>Entering ocular history:</b> <ul style="list-style-type: none"> <li>• Any history of vascular diseases of the eye?</li> <li>• Any previous injections for the eye?</li> </ul>		<b>Measurement:</b> <ul style="list-style-type: none"> <li>• An average of 3 readings should be taken, each 2 minutes apart</li> <li>• Sleeves should not be rolled tightly; if thin clothing, screening blood pressure can be taken over the top, otherwise, removal of sleeved clothing should be considered</li> </ul>	

## Management tree when seeing signs suggestive of hypertensive retinopathy



**Additional notes:**  
 \* If in-office BP measurement unavailable or cannot be performed, prompt referral to GP is recommended  
 \*\* These ophthalmic signs may not just be due to hypertensive retinopathy (e.g. papilledema), hence, urgent referral is warranted

Acknowledgements: Dr Katherine Kalloniatis and Dr Chris Gilbert for their advice regarding measuring blood pressure and medical review periods