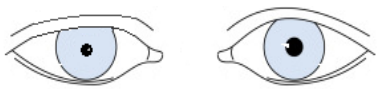
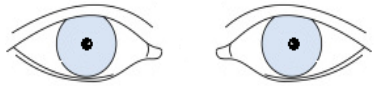
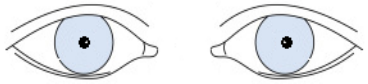
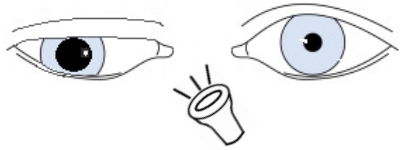
Centre for Eye Health

CHAIR-SIDE REFERENCE: PUPIL DISORDERS

PUPIL DISORDERS

Condition	Description	Common Causes
SMALL pupil is abnormal (greater anisocoria in DARK room)		
Horner's Syndrome 	• Occurs from disruption of the sympathetic pathway • Triad of signs (use acronym MAP) ▪ Unilateral **M**iosis ▪ Facial **A**nhydrosis ▪ Slight **P**tosis of the upper lid May also have an elevation of the lower lid (reverse ptosis) • Near and light responses are intact but may be a dilation lag of the affected pupil in dim conditions • Iris heterochromia (lighter iris) in congenital cases • 0.5% apraclonidine reverses the anisocoria (affected pupil dilates due to denervation supersensitivity) • In an established Horner's syndrome, hydroxyamphetamine can localise the lesion ▪ Dilation indicates a central or preganglionic lesion ▪ No dilation indicates a postganglionic lesion	• Causes can be differentiated into central, preganglionic or postganglionic lesions • Central (first order neuron) ▪ CNS disorders including Wallenberg syndrome, brainstem or spinal cord disease • Preganglionic (second order neuron) ▪ Apical lung tumour (Pancoast tumour), brachial plexus injury, metastases, chest surgery, artery aneurysm • Postganglionic (third order neuron) ▪ Internal carotid artery dissection, cavernous sinus disease ▪ Cluster headache *New onset Horner's syndrome requires immediate referral*
Argyll Robertson 	• Small irregular pupils that dilate poorly in dim lighting • Almost always bilateral but may be asymmetric • Minimal or no response to light but intact near response (light-near dissociation)	• Late syphilis *Refer for systemic investigation if no known history of syphilis*
Pharmacological 	• Unless topical, effect is usually bilateral	• Ophthalmic/topical: Pilocarpine, Carbachol • Systemic: ♣ α blockers: Tamsulosin, Phenoxybenzamine ♣ Opioids: Heroin and Morphine
LARGE pupil is abnormal (greater anisocoria in BRIGHT room)		
Pupil-involving cranial nerve III palsy 	• Dilated pupil with sluggish or no response to light • Marked ptosis • Extraocular muscle paresis and diplopia ▪ A characteristic 'down and out' position is seen as the lateral rectus and superior oblique muscle are not affected and actions are unopposed. CNIII palsy may be pupil *involving* or pupil *sparing* dependent on the underlying cause.	Pupil-involving (suggests lesion compressing upon the superficially located pupillary fibres): • Posterior communicating artery aneurysm • Less common: tumour, trauma, cavernous sinus, pituitary, orbital or viral disease Pupil-sparing: • Microvascular disease associated with diabetes, hypertension, hyperlipidaemia • Less common: compressive lesion or giant cell arteritis *Immediate referral for pupil-involving cases* *Refer for systemic investigation for pupil sparing cases* *(Close observation for patients > 60 years of age with known systemic risk factors)*

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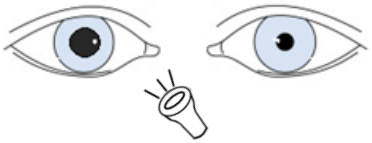
Condition	Description	Common Causes
LARGE pupil is abnormal		
Adie's tonic pupil 	• Dilated pupil with minimal to no response to light • Reduced, slow near reflex with slow re-dilation • Reduced accommodation (near blur) • Affected pupil constricts with 0.125% pilocarpine due to denervation super sensitivity (normal pupil does not) - note this may not occur in acute cases • More common in young women • Unilateral in 80% of cases but may become bilateral over time • In the long term, affected pupil can constrict and become smaller (little old Adie's) • Due to denervation of the postganglionic parasympathetic pathway	• Idiopathic • Orbital trauma or surgery • Viral illness including herpes zoster, syphilis, herpes simplex • Autoimmune disorders e.g. Sjogren's syndrome, sarcoidosis, lupus *Refer to GP for systemic investigation*
Traumatic mydriasis 	• Blunt trauma damages the iris sphincter muscle • Affected pupil may be fixed or show segmental constriction • Permanent alteration of pupil shape can occur • A torn pupillary margin or iris transillumination defects may be seen	• Blunt injury to the globe • Post surgical
Pharmacological mydriasis 	• Usually bilateral • Can be unilateral if topical or contact made with an external substance e.g. through eye rubbing • Poor/ no response to light	• Ophthalmic eye drops (e.g. Atropine, Tropicamide) • Scopolamine patch for motion sickness • Poorly fitting nebulizer • Antipsychotics and antidepressants • Antihistamines • Recreational drugs (amphetamines, LSD, cocaine)
Dorsal Midbrain Syndrome 	• Also known as Parinaud syndrome • Classic signs: ♣ Mid dilated pupils with minimal to no light response ♣ Intact near response (light-near dissociation) ♣ Up gaze paralysis ♣ Convergence retraction nystagmus	• Most common: pineal grand and other midbrain lesions *Refer for neurological investigation*
OTHER causes		
Physiological anisocoria	• Asymmetric pupil size, usually <1mm in difference • The difference in pupil size does not change with light or dim light • Normal direct, consensual and near response	• Physiological, can be found in up to 20% of the population *Routine review required*
Iritis	• Miotic pupil due to iridoplegia and spasm of the iris sphincter • Posterior synechiae may alter pupil shape	
Acute angle closure (AAC)	• Mid dilated pupil due to ischaemia of the iris sphincter muscle	

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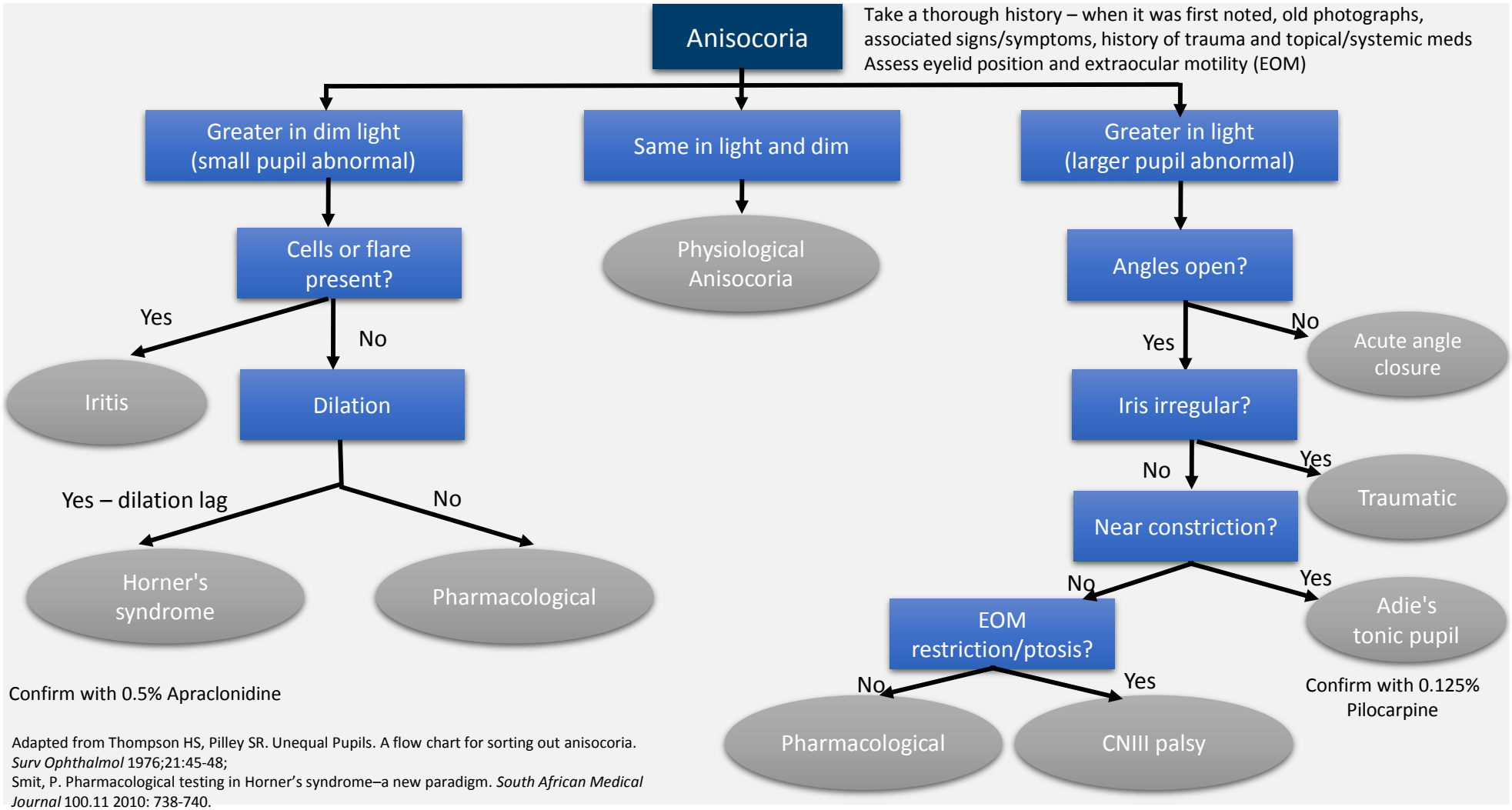
DIFFERENTIAL DIAGNOSIS OF ANISOCORIA



Adapted from Thompson HS, Pilley SR. Unequal Pupils. A flow chart for sorting out anisocoria. *Surv Ophthalmol* 1976;21:45-48;
Smit, P. Pharmacological testing in Horner's syndrome–a new paradigm. *South African Medical Journal* 100.11 2010: 738-740.

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This reference is based on the current literature and evidence at the time of writing. It is designed as a guide to aid diagnosis and management decisions however individual cases must be assessed in the context of all available clinical data.

For personalised diagnosis and management support, Australian optometrists can book a telehealth consultation with a senior CFEH optometrist. Consultations are free, thanks to the generous support of Guide Dogs NSW/ACT.