



## BLOCK: Mental health care and Neurology

Neurology section lec.2

# Stroke 1

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Davidson s principles and practice of medicine





# objective

1. What is stroke, TIA and its impact on life.
2. The vascular anatomy and physiology and pathology behind stroke.
3. What are the risk factors for stroke, ischemic and hemorrhagic.
4. The presenting features and clinical examination findings and importance of each finding in patient management.
5. ddx of stroke.
6. Stroke syndromes.

# Introduction

- ❖ **Cerebrovascular disease** refers to a **group of conditions** that affect blood flow and the blood vessels in the brain. Problems with blood flow may occur from blood vessels narrowing (stenosis), clot formation (thrombosis), artery blockage (embolism), or blood vessel rupture (hemorrhage).
- ❖ Cerebrovascular disease is the **third most** common cause of death in high-income countries after cancers and ischemic heart disease, and the **most common cause** of **severe** physical disability. **About 20% of stroke patients die within a month of the event and at least half of those who survive are left with physical disability.**

❖ **Stroke** is the most common clinical manifestation of cerebrovascular disease and results in episodes of brain dysfunction due to focal ischemia(85%) or hemorrhage(15%) i.e., it is an acute, focal brain dysfunction due to vascular disease.

❖ **transient ischemic attack (TIA)** :is a stroke that lasts only a few minutes. It occurs when the blood supply to part of the brain is briefly interrupted. TIA symptoms, which usually occur suddenly, are similar to those of stroke but do not last as long.

❖ **Progressing stroke (or stroke in evolution)** describes a stroke in which the focal neurological deficit **worsens** after the patient first presents. Such worsening may be due to **increasing volume of infarction, hemorrhagic transformation or increasing cerebral oedema**.

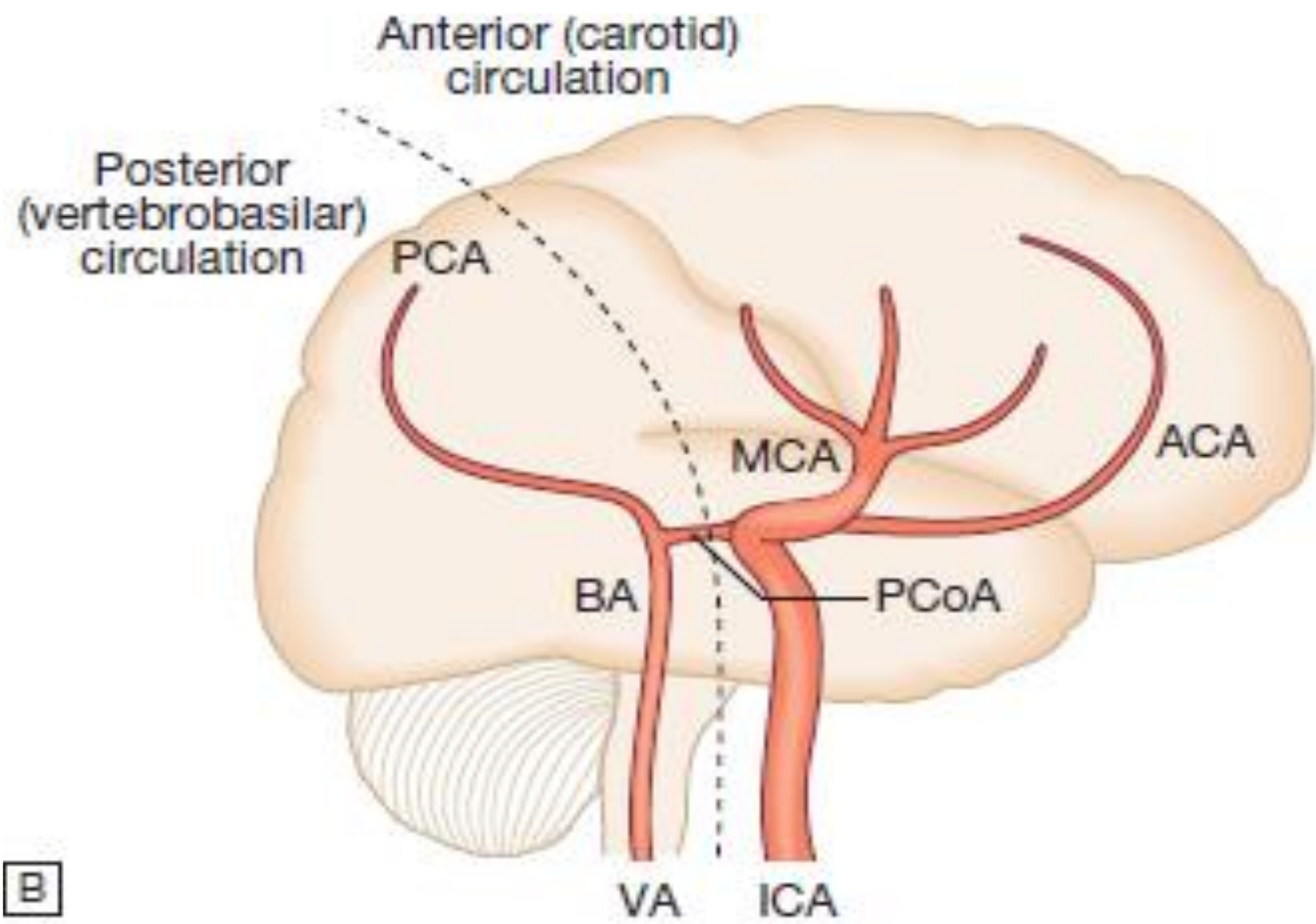
❖ **Completed stroke** describes a stroke in which the focal deficit persists and is not progressing.

# Functional anatomy and physiology

The main arterial supply of the brain comes from the **internal carotid arteries**, which supply the anterior brain through the anterior and middle cerebral arteries, and the **vertebral and basilar arteries** (vertebrobasilar system), which provide the posterior circulation to the posterior cerebral arteries.

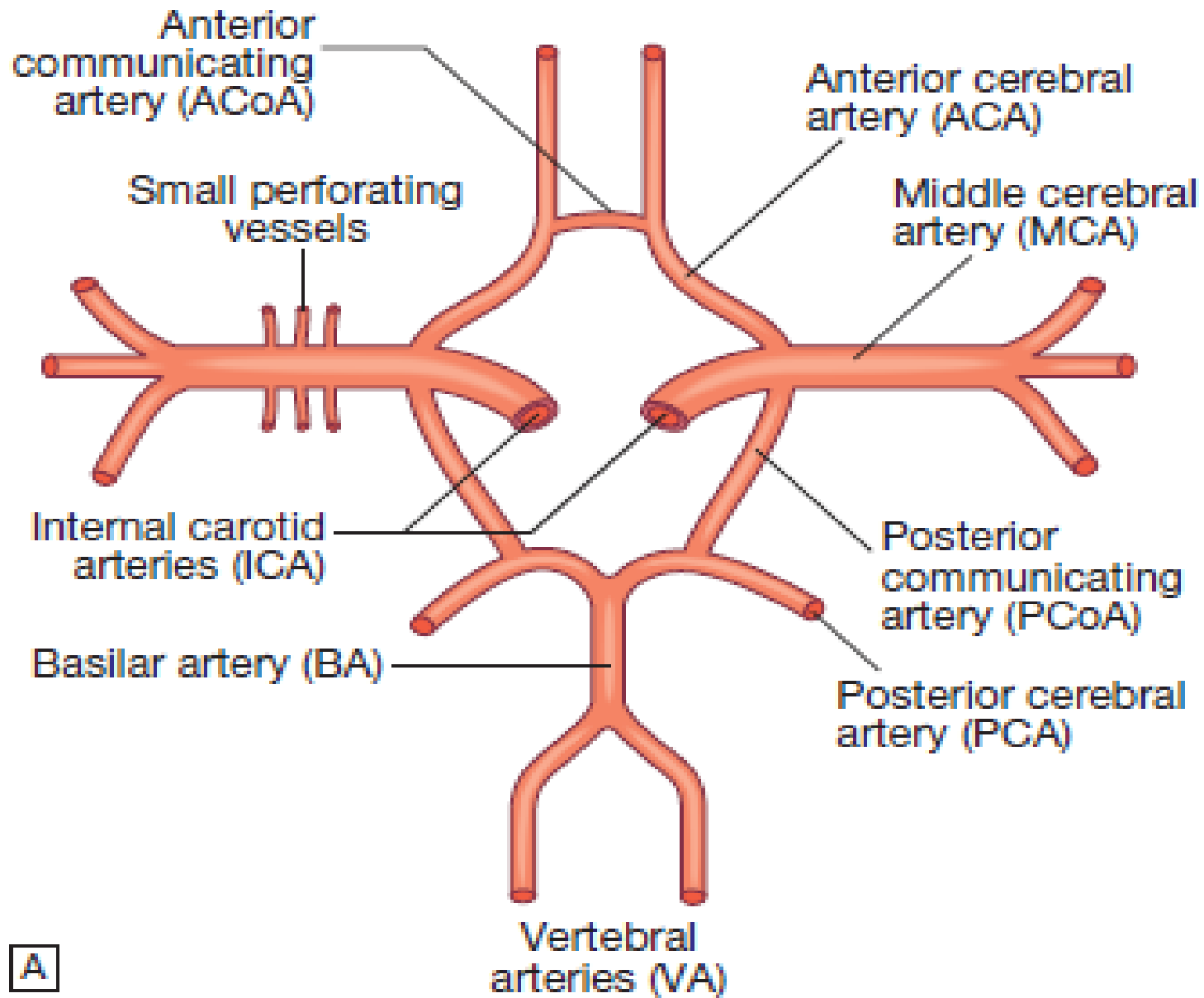
- The anterior and middle cerebral arteries supply the frontal and parietal lobes,
- posterior cerebral artery supplies the occipital lobe.
- The vertebral and basilar arteries perfuse the brainstem, mid-brain and cerebellum.

Communicating arteries provide connections between the anterior and posterior circulations and between left and right hemispheres, creating protective anastomotic connections that form the circle of Willis.



**B**

V.





In **health**, **autoregulatory mechanisms** maintain a constant cerebral blood flow across a **wide range** of arterial blood pressures(50-150 mmhg) to meet the high resting metabolic activity of brain tissue; cerebral blood vessels dilate when systemic blood pressure is lowered and constrict when it is raised.

This autoregulatory mechanism can be disrupted after stroke.

❖ The venous collecting system is formed by a collection of sinuses over the surface of the brain, which drain into the jugular veins.

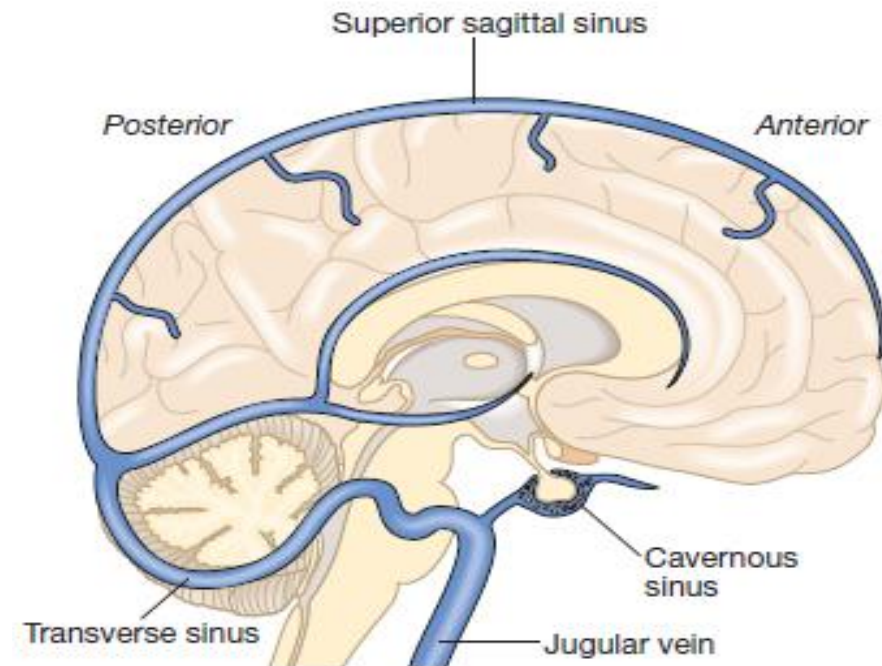


Fig. 26.3 Venous circulation of the brain.

# Pathology of stroke

❖ Cerebral infarction is mostly caused by:

1. **thromboembolic** disease secondary to atherosclerosis in the major extracranial arteries (carotid artery and aortic arch).

2. About 20% of infarctions are due to embolism from the heart.

3. 20% are due to thrombosis in situ caused by intrinsic disease of small perforating vessels (lenticulostriate arteries), producing so-called **lacunar infarctions**.

# Risk factors for stroke



## 26.1 Risk factors for stroke

### Fixed risk factors

- Age
- Gender (male > female except at extremes of age)
- Race (Afro-Caribbean > Asian > European)
- Previous vascular event:
  - Myocardial infarction
  - Stroke
  - Peripheral vascular disease
- Heredity
- Sickle cell disease
- High fibrinogen

### Modifiable risk factors

- Blood pressure
- Cigarette smoking
- Hyperlipidaemia
- Diabetes mellitus
- Heart disease:
  - Atrial fibrillation
  - Congestive cardiac failure
  - Infective endocarditis
- Excessive alcohol intake
- Oestrogen-containing drugs:
  - Oral contraceptive pill
  - Hormone replacement therapy
- Polycythaemia



## 26.2 Causes of intracerebral haemorrhage and associated risk factors

Disease	Risk factors
Complex small-vessel disease with disruption of vessel wall	Age Hypertension High cholesterol
Amyloid angiopathy	Familial (rare) Age
Impaired blood clotting	Anticoagulant therapy Blood dyscrasia Thrombolytic therapy
Vascular anomaly	Arteriovenous malformation Cavernous haemangioma
Substance misuse	Alcohol Amphetamines Cocaine

# Presenting problems

Most vascular lesions develop **suddenly** within a matter of minutes or hours, and so should be considered in the differential diagnosis of patients with any acute neurological presentation.

**1.Weakness:** Unilateral weakness is the classical presentation of stroke and, much more rarely, of CVT. The weakness is sudden, progresses rapidly and follows a hemiplegic pattern. There is rarely any associated abnormal movement. Reflexes are initially reduced but then become increased with a spastic pattern of increased tone. Upper motor neuron weakness of the face (7th cranial nerve) is often present.

**2.Speech disturbance:** Dysphasia and dysarthria are the most common presentations of disturbed speech in stroke. **Dysphasia indicates damage to the dominant** frontal or parietal lobe while **dysarthria is a non-localising feature that reflects weakness or incoordination** of the face, pharynx, lips, tongue or palate.

**3. Visual deficit:** Visual loss can be due to unilateral optic ischaemia (called amaurosis fugax if transient), caused by disturbance of blood flow in the internal carotid artery and ophthalmic artery, leading to monocular blindness.

Ischaemia of the occipital cortex or post-chiasmic nerve tracts results in a contralateral hemianopia.

**4. Visuo-spatial dysfunction:** Damage to the **non-dominant cortex** often results in contralateral visuo-spatial dysfunction, e.g. sensory or visual neglect and **apraxia (inability to perform complex tasks despite normal motor, sensory and cerebellar function)**, sometimes misdiagnosed as delirium.

**5. Ataxia:** Stroke causing damage to the cerebellum and its connections can present as an acute ataxia and there may be associated brainstem features such as diplopia and vertigo.

**5.Headache:** Sudden severe headache is the cardinal symptom of SAH but also occurs in intracerebral haemorrhage. Although headache is common in acute ischaemic stroke, it is rarely a dominant feature. Headache also occurs in cerebral venous disease.

**6.Seizure:** Seizure is unusual in acute stroke but may be generalised or focal (especially in cerebral venous disease).

**7.Coma:** Coma is uncommon, though it may occur with a brainstem event.

If present in the first 24 hours, it usually indicates a subarachnoid or intracerebral haemorrhage.

# Differential diagnosis of stroke and TIA

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### 26.3 Differential diagnosis of stroke and transient ischaemic attack

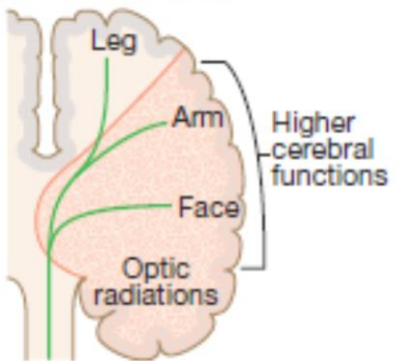
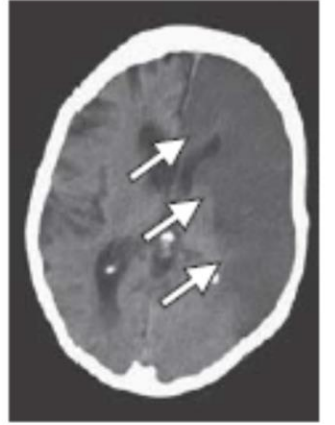
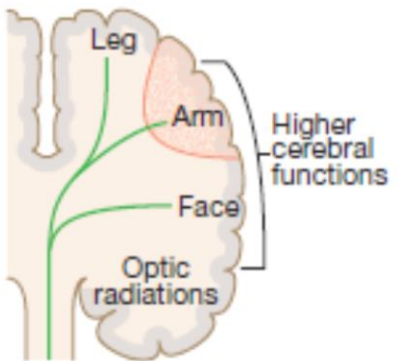

#### 'Structural' stroke mimics

- Primary cerebral tumours
- Metastatic cerebral tumours
- Extradural or subdural haematoma
- Demyelination
- Peripheral nerve lesions (vascular or compressive)
- Cerebral abscess

#### 'Functional' stroke mimics

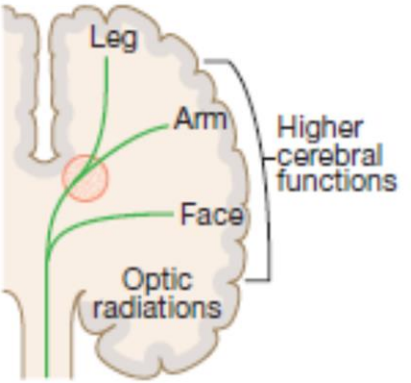

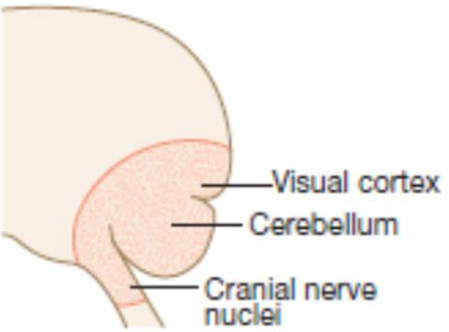

- Todd's paresis (after epileptic seizure)
- Hypoglycaemia
- Migrainous aura (with or without headache)
- Focal seizures
- Ménière's disease or other vestibular disorder
- Conversion disorder (p. 1202)
- Encephalitis

# Clinical and radiological features of the stroke syndromes

Clinical syndrome	Common symptoms	Common cause	CT scan features
<p>Total anterior circulation syndrome (TACS)</p> 	<p>Combination of:</p> <ul style="list-style-type: none"> <li>Hemiparesis</li> <li>Higher cerebral dysfunction (e.g. aphasia)</li> <li>Hemisensory loss</li> <li>Homonymous hemianopia (damage to optic radiations)</li> </ul>	<p>Middle cerebral artery occlusion</p> <p>(Embolism from heart or major vessels)</p>	
<p>Partial anterior circulation syndrome (PACS)</p> 	<ul style="list-style-type: none"> <li>Isolated motor loss (e.g. leg only, arm only, face)</li> <li>Isolated higher cerebral dysfunction (e.g. aphasia, neglect)</li> <li>Mixture of higher cerebral dysfunction and motor loss (e.g. aphasia with right hemiparesis)</li> </ul>	<p>Occlusion of a branch of the middle cerebral artery or anterior cerebral artery</p> <p>(Embolism from heart or major vessels)</p>	



# Clinical and radiological features of the stroke syndromes cont..

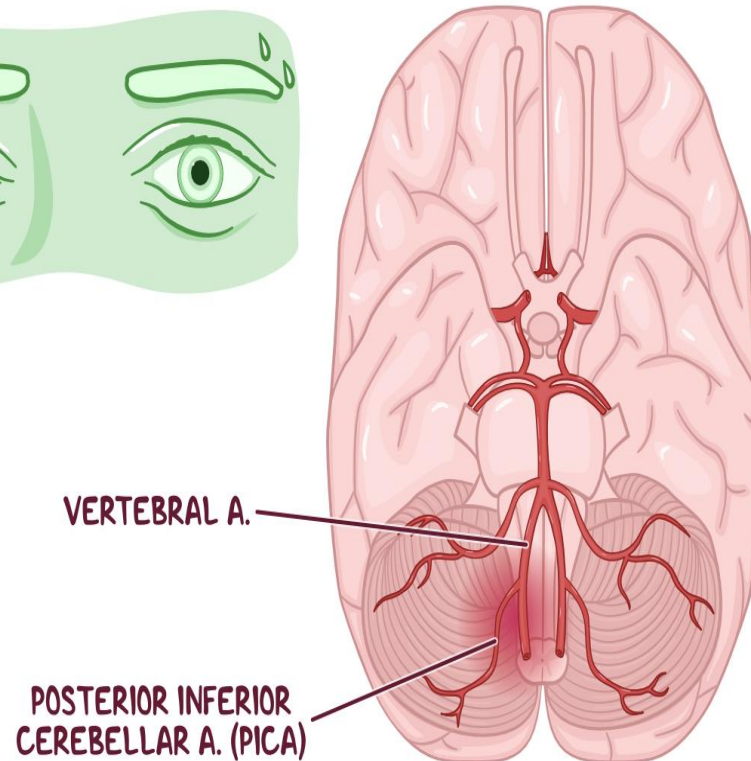
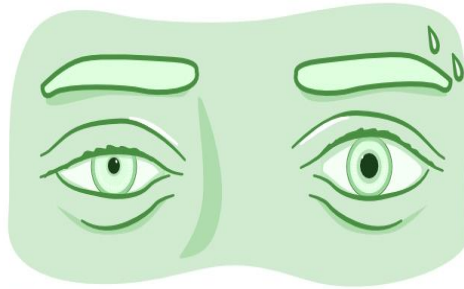
<p>Lacunar syndrome (LACS)</p> 	<p>Pure motor stroke – affects two limbs</p> <p>Pure sensory stroke</p> <p>Sensory-motor stroke</p> <p>No higher cerebral dysfunction or hemianopia</p>	<p>Thrombotic occlusion of small perforating arteries</p> <p>(Thrombosis in situ)</p>	
<p>Posterior circulation stroke (POCS) (lateral view)</p> 	<p>Homonymous hemianopia (damage to visual cortex)</p> <p>Cerebellar syndrome</p> <p>Cranial nerve syndromes</p>	<p>Occlusion in vertebral, basilar or posterior cerebral artery territory</p> <p>(Cardiac embolism or thrombosis in situ)</p>	

# WALLENBERG SYNDROME

"LATERAL MEDULLARY SYNDROME" OR  
"POSTERIOR INFERIOR CEREBELLAR ARTERY (PICA) SYNDROME"

## SYMPTOMS:

- HORNER SYNDROME (DECREASED PUPIL SIZE, DROOPING EYELID, DECREASED SWEATING)
- DOUBLE VISION
- SLURRED SPEECH
- DIZZINESS



Anatomical location	Presenting symptoms
Spinothalamic tract	Contralateral loss of pain and temperature sensation
Spinal trigeminal nucleus	Ipsilateral facial loss of pain and temperature
Nucleus ambiguus	Supplies vagus and glossopharyngeal nerves; dysphagia/dysphonia/diminished gag reflex
Inferior vestibular nucleus	Vertigo/diplopia/nystagmus/vomiting
Sympathetic fibres	Ipsilateral Horner's syndrome
Central trigeminal tract	Palatal clonus
Inferior cerebellar peduncle	Ataxia

# Clinical examination in stroke disease

## 5 Cranial nerve function

Neck stiffness/pain  
Visual fields  
Nerve palsy, e.g. 3rd, 6th, 7th or 12th

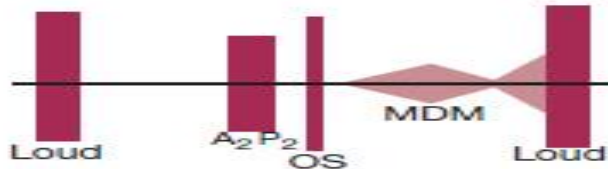


▲ Visual field defect

## 4 Higher cerebral function

Speech and language  
Attention and neglect  
Abbreviated mental test

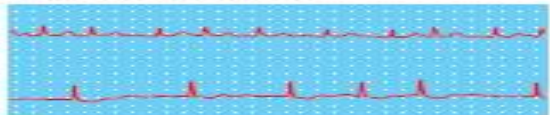
## 3 Blood pressure and cardiac auscultation



▲ Mitral stenosis

## 2 Pulse

Rate and rhythm



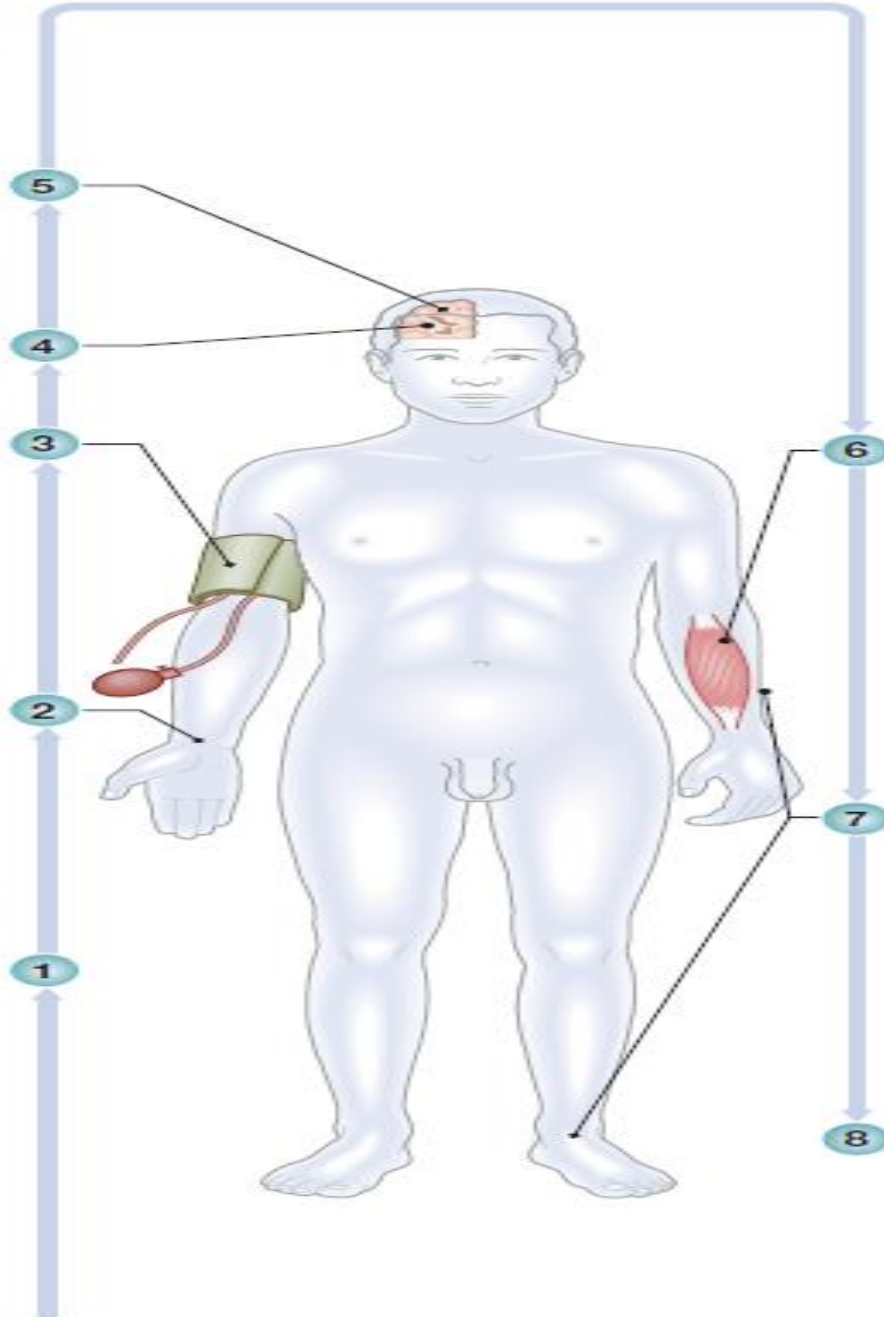
▲ Atrial fibrillation

## 1 General appearance

Conscious level  
Posture: leaning to one side?  
Facial symmetry



▲ Left facial (7th nerve) palsy



## 6 Motor system

Muscle bulk  
Abnormal posture or movements  
Tone  
Strength, including pronator drift  
Co-ordination  
Tendon reflexes  
Plantar reflexes



▲ Left pronator drift

## 7 Sensory system

Touch sensation  
Cortical sensory function:  
sensory inattention or neglect  
Joint position sense



▲ Extensor plantar reflex

## 8 Gait

Able to weight-bear?  
Ataxic  
Hemiparetic gait pattern



▲ Hemiparetic posture

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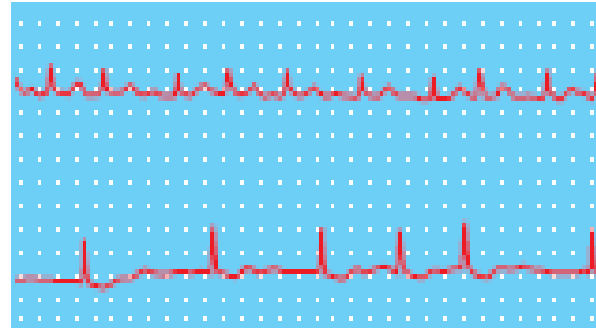
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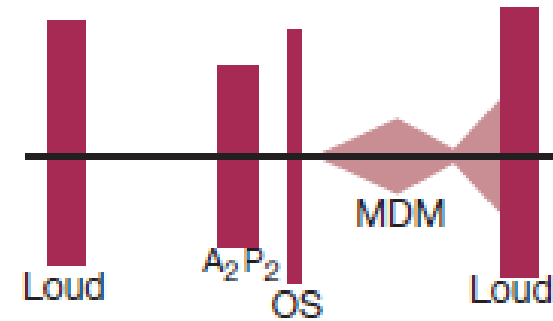
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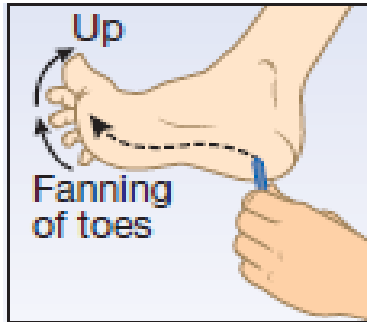
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**i****General examination****Skin**

- Xanthelasma
- Rash (arteritis, splinter haemorrhages)
- Colour change (limb ischaemia, deep vein thrombosis)
- Pressure injury

**Eyes**

- Arcus senilis
- Diabetic retinopathy
- Hypertensive retinopathy
- Retinal emboli

**Cardiovascular system**

- Heart rhythm (?atrial fibrillation)
- Blood pressure (high or low)
- Carotid bruit
- Jugular venous pulse (raised in heart failure, low in hypovolaemia)
- Murmurs (source of embolism)
- Peripheral pulses and bruits (?generalised arteriopathy)

**Respiratory system**

- Signs of pulmonary oedema or infection
- Oxygen saturation

**Abdomen**

- Palpable bladder (urinary retention)

**Locomotor system**

- Injuries sustained during collapse
- Comorbidities that influence recovery, e.g. osteoarthritis

# Rapid assessment of suspected stroke

## 1. Rosier scale

Can be used by emergency staff to indicate probability of a stroke in acute presentations:

Unilateral facial weakness +1

Loss of consciousness -1

Unilateral grip weakness +1

Seizure -1

Unilateral arm weakness +1

Unilateral leg weakness +1

Speech loss +1

Visual field defect +1

- Total (-2 to +6); score of > 0 indicates stroke is possible cause.

## 2. Exclusion of hypoglycaemia

## 3. Language deficit

- History and examination may indicate a language deficit
- Check comprehension ('lift your arms, close your eyes') to identify a receptive dysphasia
- Ask patient to name people/objects (e.g. nurse, watch, pen) to identify a nominal dysphasia
- Check articulation (ask patient to repeat phrases after you) for dysarthria

## 4. Motor deficit

- Subtle pyramidal signs:
- Check for pronator drift: ask patient to hold out arms and maintain their position with eyes closed
- Check for clumsiness of fine finger movements

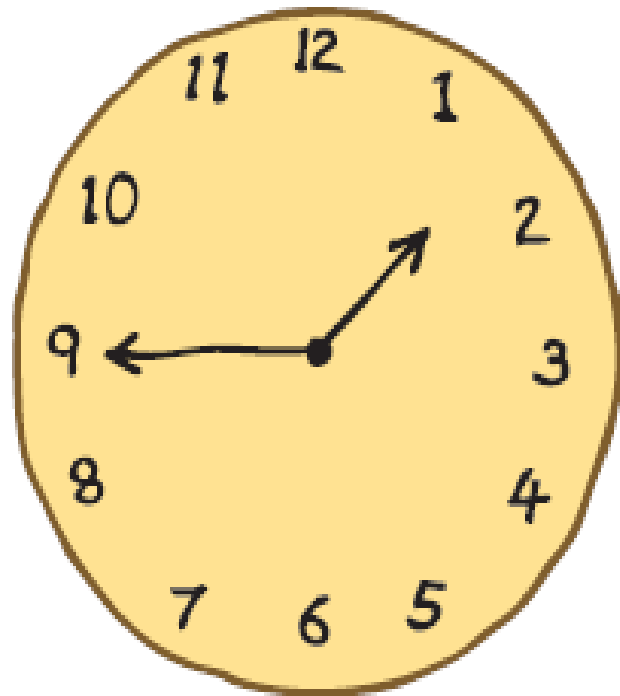
## 5. Sensory and visual inattention

- Establish that sensation/visual field is intact on testing one side at a time
- Retest sensation/visual fields on simultaneous testing of both sides; the affected side will no longer be felt/seen.
- Perform clock drawing test (see below)

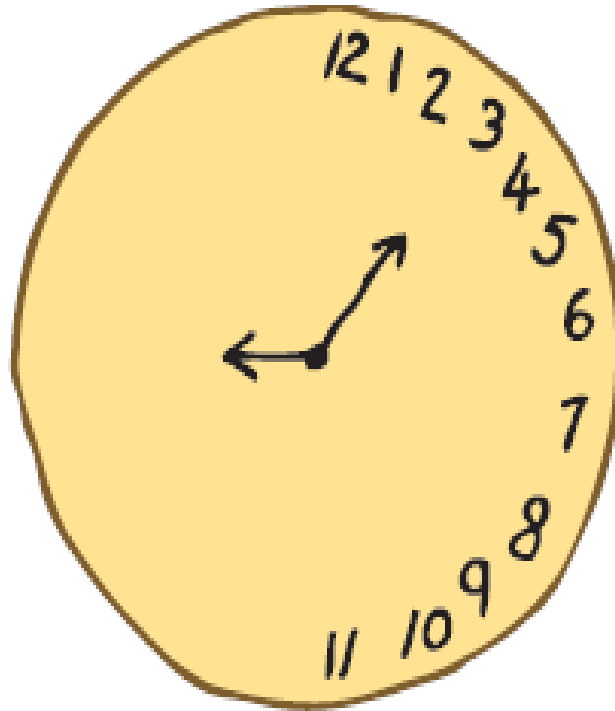
## 6. Truncal ataxia

- Check if patient can sit up or stand without support.





A



B

Clock drawing test **A** An image drawn by a doctor. **B** An image drawn by a patient with left-sided neglect.

thanks