

The background is a dark blue gradient with a starry pattern. It features several technical graphics: a large circular scale with numerical markings from 0 to 220 in the upper right; a smaller circular scale with markings from 0 to 100 in the lower right; and various dashed and solid circular lines and arrows scattered across the frame, suggesting a technical or scientific theme.

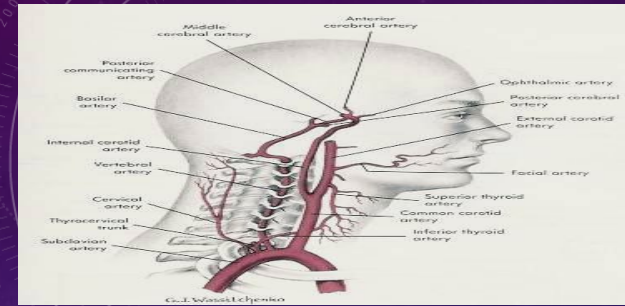
# **STROKE**

## Cerebrovascular Accident

# OBJECTIVE

- 1- obtain simple knowledge about vascularity of brain
- 2- understand different clinical scenario of vascular disorders
- 3- describe how to handle and treat such patients

# ANATOMY



ICAs give off no branches in the neck

Pass in carotid canal in petrous bone and then to cavernous sinus.

Cavernous carotid give off **ophthalmic** artery and then pierces the dura.

Supraclinoid portion gives off **Anterior communicating**, and **posterior communicating** arteries before bifurcation into **MCA & ACA**



# CIRCLE OF WILLIS

- Circle of Willis

Anastomosis of arteries at base of brain

Permits collateral circulation

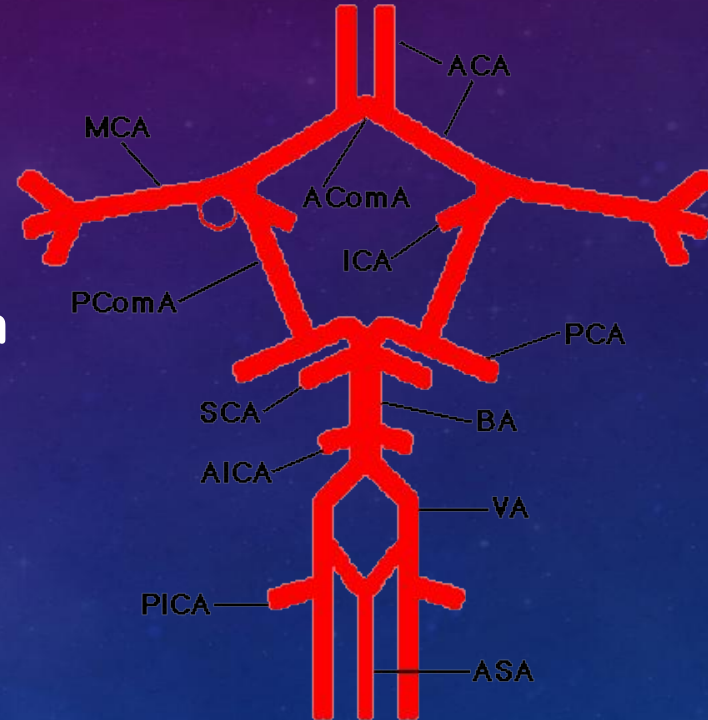
Formed by 6 vessels

internal carotid

anterior and posterior cerebral

anterior communicating

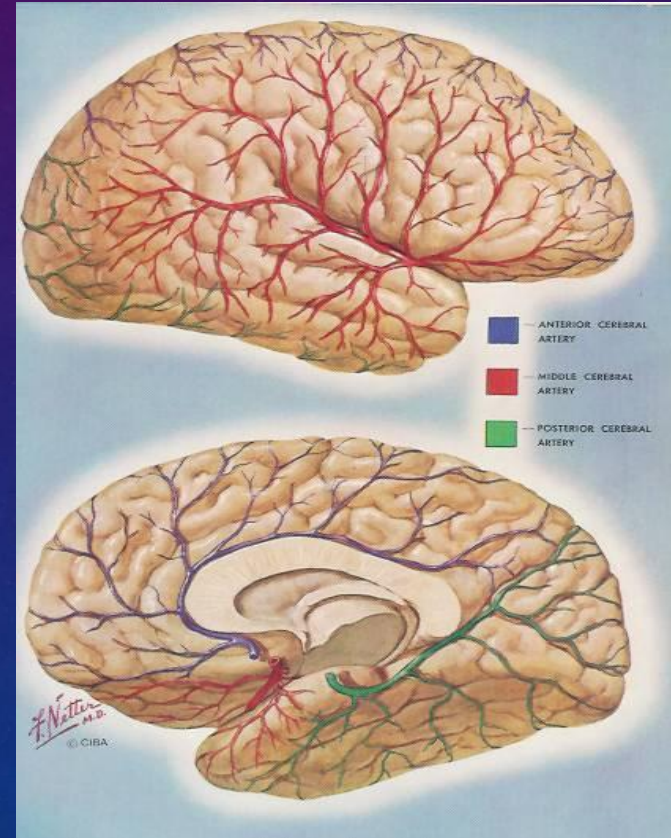
two posterior communicating





# BLOOD SUPPLY TO THE BRAIN

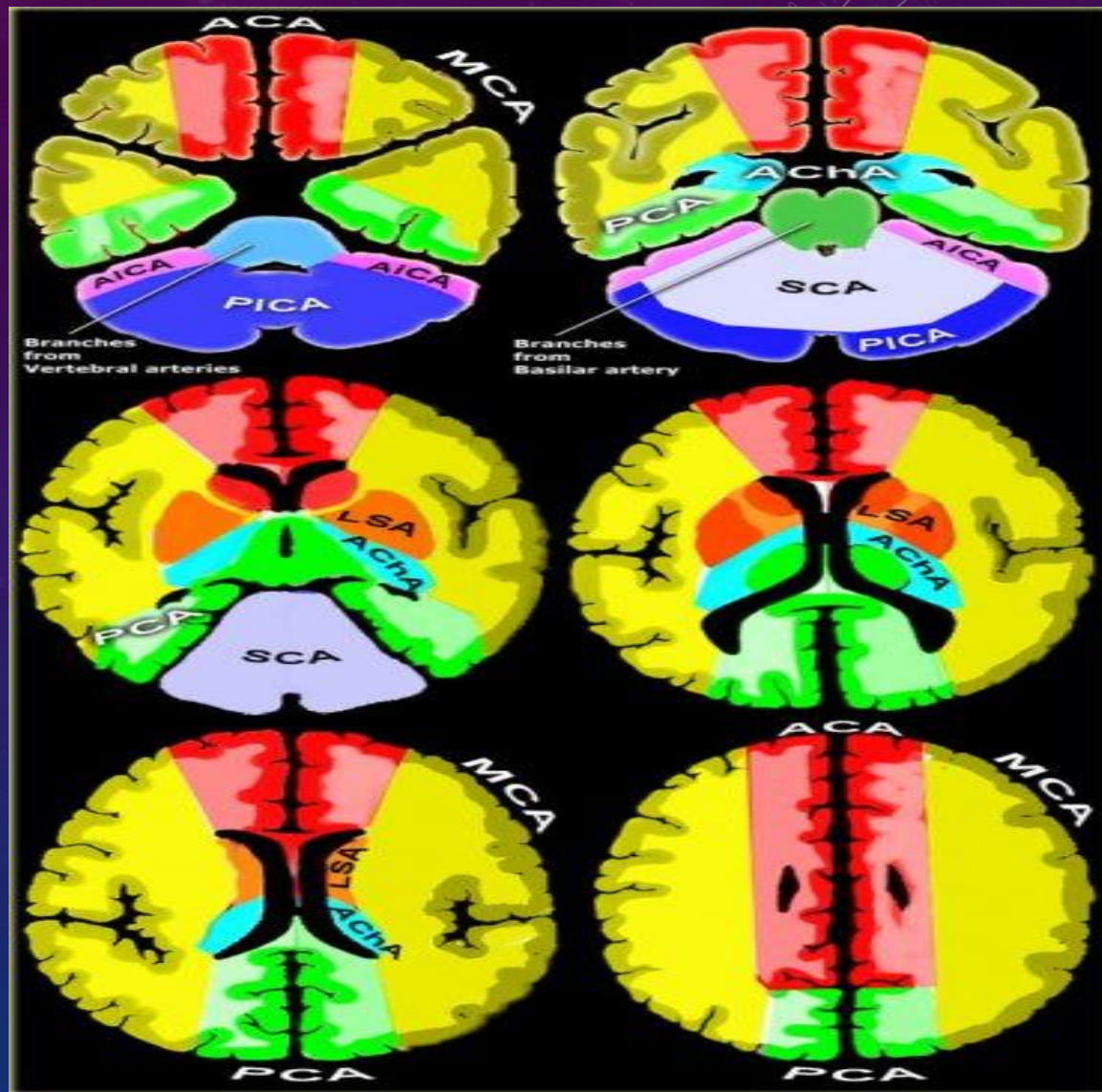
- Anterior Cerebral (blue)
  - Basal ganglia, corpus callosum, medial surface of cerebral hemispheres; superior surface frontal and parietal lobes
- Middle Cerebral (red)
  - Frontal lobe, parietal lobe, cortical surface of the temporal lobe
- Posterior Cerebral (green)
  - Part of diencephalon and temporal lobe, occipital lobe



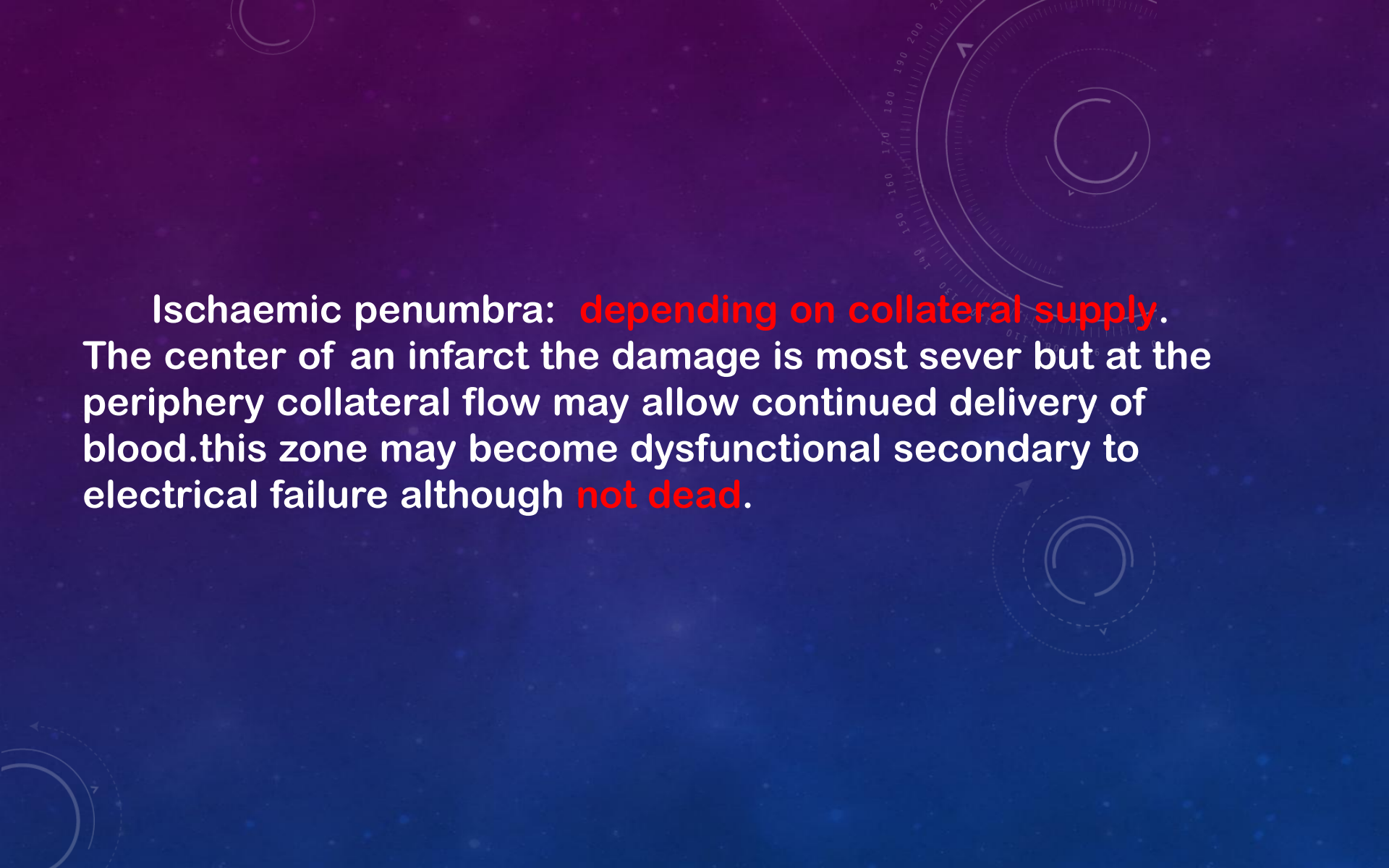
# CEREBRAL ARTERY AREAS



1. anterior cerebral
2. Middle cerebral
3. Penetrating branches of middle cerebral
4. anterior choroidal
5. Posterior cerebral





The background is a dark blue gradient with faint, glowing technical graphics. On the right side, there are several concentric circles and arcs, some with tick marks and numbers (150, 160, 170, 180, 190, 200, 210, 220) along their perimeters, resembling a gauge or a scale. There are also some dashed lines and arrows pointing in various directions, suggesting a technical or scientific theme.

Ischaemic penumbra: **depending on collateral supply.**  
The center of an infarct the damage is most severe but at the periphery collateral flow may allow continued delivery of blood.this zone may become dysfunctional secondary to electrical failure although **not dead.**

# ACUTE STROKE

is characterised by the rapid appearance (usually over minutes) of a focal deficit of brain function, most commonly a hemiplegia with or without signs of focal higher cerebral dysfunction (such as aphasia), hemisensory loss, visual field defect or brain-stem deficit.

### *Transient ischaemic attack (TIA).*

This is the term reserved for those events in which **symptoms last less than 24 hours.**

### *Progressing stroke (or stroke in evolution)*

This 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, haemorrhagic transformation or increasing oedema.

### *Completed stroke*

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

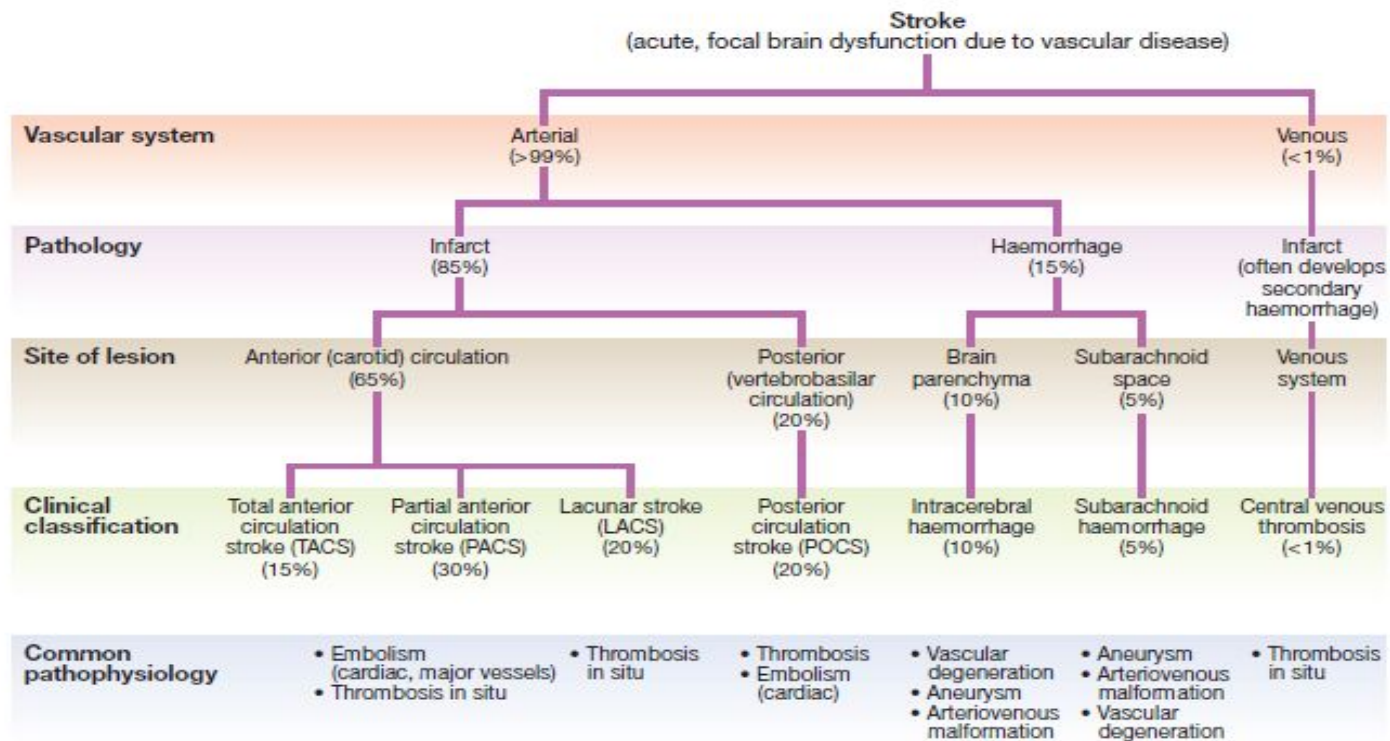


Fig. 27.1 Stroke classification



## **Structural' stroke mimics**

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

## **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

# STROKE RISK FACTORS

## Fixed

Age

Gender (male > female, except in the very young and very old)

Race (Afro-Caribbean > Asian > European)

Heredity

Previous vascular event, e.g. myocardial infarction, stroke or peripheral embolism

High fibrinogen

## **MODIFIABLE**

High blood pressure

Heart disease (atrial fibrillation, heart failure, endocarditis)

Diabetes mellitus

Hyperlipidaemia

Smoking

Excess alcohol consumption

Polycythaemia

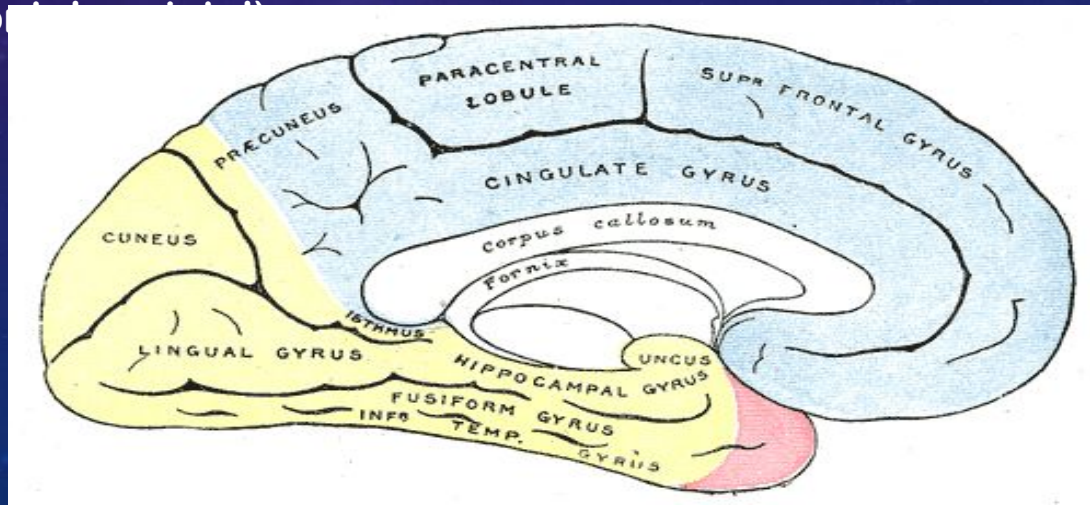
Oral contraceptives

Social deprivation

# ACA

Runs above the optic nerve to follow the curve of the corpus callosum

- Deep (penetrating) branches of the ACA pass to the anterior part of the internal capsule and basal ganglia
- Cortical branches supply the medial surface of the hemisphere (orbital, frontopolar, etc.)





Occlusion of the anterior cerebral artery may result in the following defects:<sup>1</sup>

Paralysis or weakness of the contralateral foot and leg

Sensory loss in the contralateral foot and leg

Left sided strokes may develop aphasia(Broca)

Gait apraxia ,Urinary incontinence which usually occurs with bilateral damage in the acute phase

# MCA

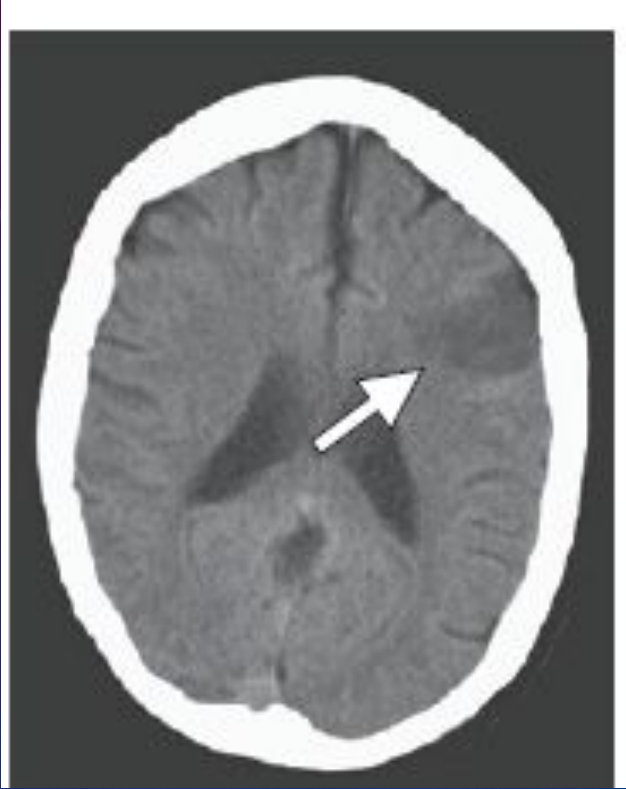
MCA is the largest branch that comes off the ICA

- It has deep branches that supply part of the internal capsule and basal ganglia (putamen, caudate nucleus and globus pallidus)
- It passes out to the lateral surface of the cerebral hemisphere where it supplies blood to the cortical areas of the temporal, frontal and parietal lobes

# MCA

**Paralysis of the contralateral face, arm (more-so) and leg**

- **Sensory impairment over the contralateral face, arm ( more-so) and leg**
- **Homonymous hemianopsia.**
- Paralysis of gaze to the opposite side
- **Aphasia (dominant) (Wernick )**and dysarthria
- Unilateral neglect, apraxia and agnosia for half of external space (non-d)





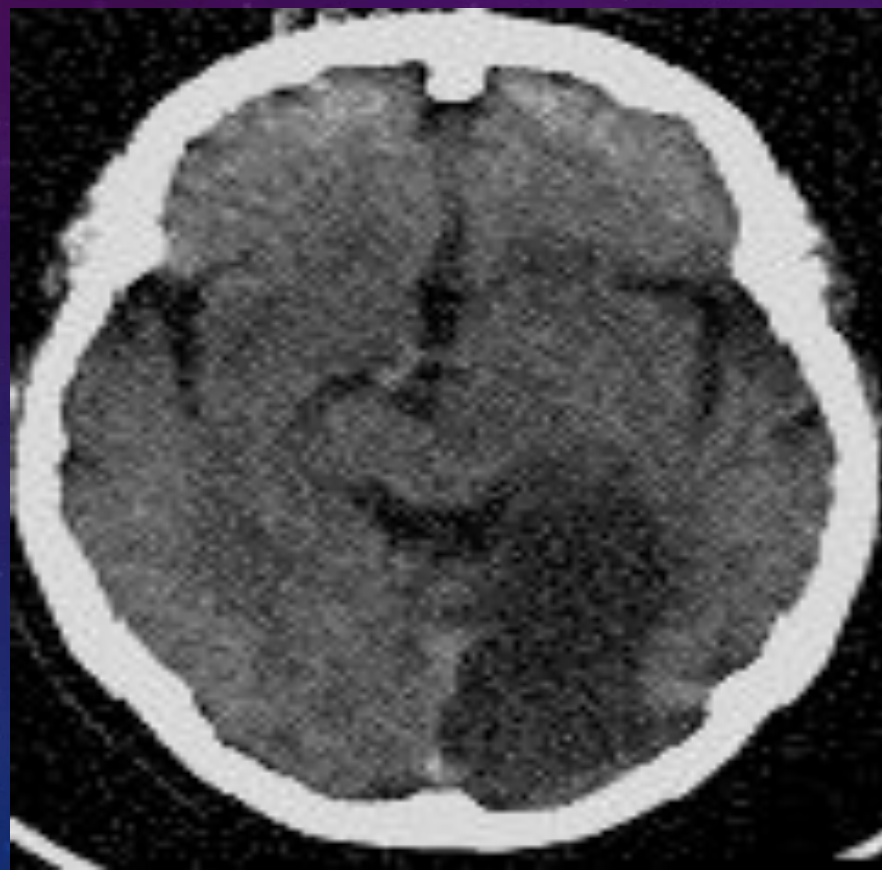
# POSTERIOR CIRCULATION

- The VA and its branches supply the medulla and the inferior surface of the cerebellum
- The BA supplies the brain stem from the medulla upwards and the posterior cerebellum. It divides into the 2 PCA.
- Deficits to these territories could include –

**Quadraplegia , diplopia, ataxia, dizziness, vertigo, nystagmus, weakness of facial, lingual and pharyngeal muscles, dysarthria, dysphagia, unconsciousness**

# PCA

- Pure hemisensory loss(thalamus)
- Contralateral homonymous hemianopia with macular sparing(occipital lobe)
- Visual agnosia
- Disorder of reading (alexia,dyslexia)
- Anisognosia & prpsognosia



# PICA

## LATERAL MEDULLARY SYNDROME

### WALLENBERG SYNDROME

- Ipsilateral cerebellar; ataxia, nystagmus
- Ipsilateral horner's syndrome
- Ipsilateral facial loss of pinprick
- Contralateral signs of spinothalamic sensory loss of limb/pain and temperature
- AICA-symptoms are similar to but add: ipsilateral facial paralysis and deafness



# LACUNAR INFARCTS

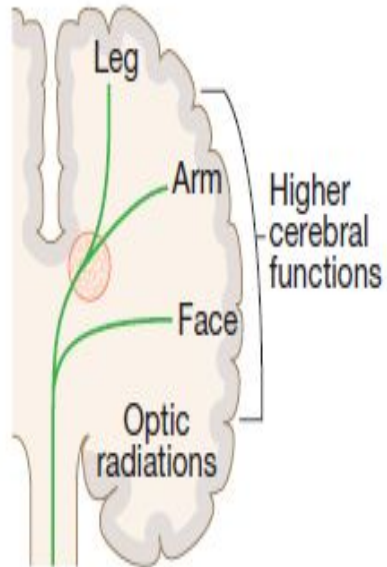
Lacunar infarcts are small infarcts in the deeper parts of the brain (**basal ganglia, thalamus, white matter**) and in the brain stem.

Lacunar infarcts are caused by occlusion of a single deep penetrating artery.

Lacunar infarcts account for **25%** of all ischemic strokes.

**Atherosclerosis** is the most common cause of lacunar infarcts followed by emboli.

## Lacunar syndrome (LACS)



Pure motor stroke – affects two limbs

Pure sensory stroke

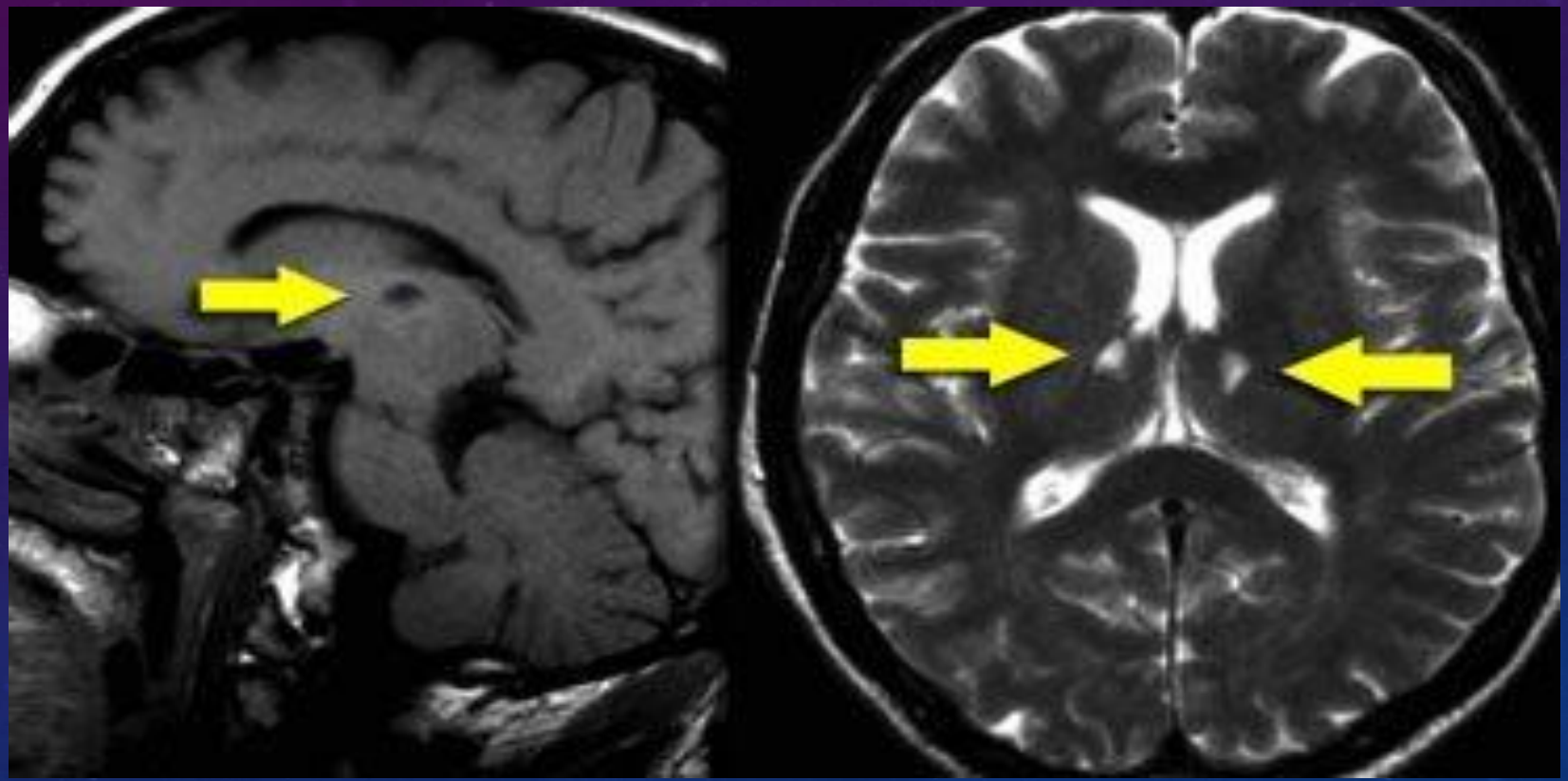
Sensory-motor stroke

No higher cerebral dysfunction or hemianopia

Thrombotic occlusion of small perforating arteries

(Thrombosis in situ)





# How to **examine** a stroke patient

**Skin Xanthelasma**

**Rash (arteritis, splinter haemorrhages, livedo reticularis)**

**Colour and temperature change (limb ischaemia/deep venous thrombosis)**

**Eyes Arcus senilis**

**Diabetic changes**

**Hypertensive changes**

**Retinal emboli**

**Abdomen Palpable bladder (urinary retention)**

**Locomotor Injuries sustained during collapse with stroke**

**Cardiovascular system Heart rhythm (atrial fibrillation)**

**Blood pressure (hypertension, hypotension)**

**Jugular venous pressure (heart failure, hypovolaemia)**

**Murmurs (sources of embolism)**

**Peripheral pulses and bruits (generalised arteriopathy)**

**Respiratory system Signs of pulmonary oedema**

**Signs of respiratory infection**



## CEREBRAL VASCULAR ACCIDENT (CVA) "BRAIN ACCIDENT"

- HEADACHE
- MENTAL CHANGES
  - CONFUSION
  - DISORIENTATION
  - MEMORY IMPAIRMENT

• APHASIA (CVA LEFT HEMISPHERE)

• RESP PROBLEMS  
(↓ NEURO MUSCULAR CONTROL)

• ↓ COUGH / SWALLOW REFLEX

• AGNOSIA (↓ SENSORY INTERPRETATION)

• INCONTINENCE

• SEIZURES

TIA: • HEADACHE  
• CONFUSION  
• VERTIGO  
• DYSARTHRIA  
• TRANSIENT HEMIPARESIS  
• TEMPORARY VISION CHANGES  
• SYNCOPE



• HEMIPARESIS OR HEMIPLEGIA

• HYPERTHERMIA

• EMOTIONAL LABILITY

• VISUAL CHANGES  
(HOMONYMOUS HEMIANOPSIA)



HORNER'S SYNDROME

• VOMITING

• PERCEPTUAL DEFECTS  
(CVA RIGHT HEMISPHERE)

• HYPERTENSION

• APRAXIA  
(↓ LEARNED MOVEMENTS)

Focal Neurologic S/S:

- PARALYSIS
- SENSORY LOSS
- LANGUAGE DISORDER
- REFLEX CHANGES

## DIAGNOSTIC QUESTION INVESTIGATION

Is it a vascular lesion? --CT/MRI

Is it ischaemic or haemorrhagic?-- CT/MRI

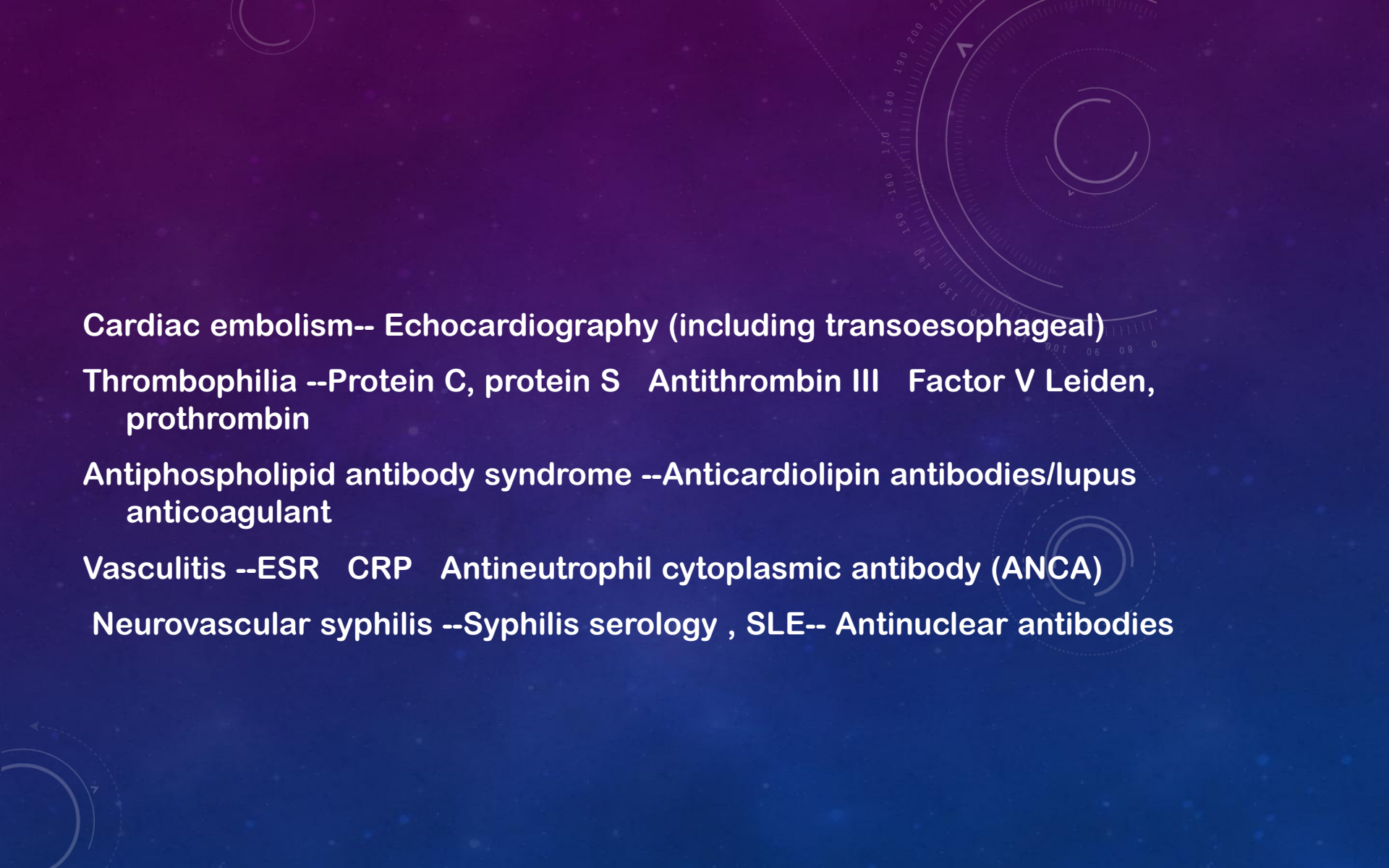
Is it a subarachnoid haemorrhage? --CT/lumbar puncture

Is there any cardiac source of embolism?-- Electrocardiogram (ECG)  
24-hour ECG Echocardiogram

What is the underlying vascular disease? --Duplex ultrasound of carotids  
Magnetic resonance angiography (MRA) CT angiography (CTA)  
Contrast angiography

What are the risk factors?-- Full blood count Cholesterol Blood  
glucose

Is there an unusual cause?-- ESR Serum protein electrophoresis ANA



**Cardiac embolism-- Echocardiography (including transoesophageal)**

**Thrombophilia --Protein C, protein S Antithrombin III Factor V Leiden, prothrombin**

**Antiphospholipid antibody syndrome --Anticardiolipin antibodies/lupus anticoagulant**

**Vasculitis --ESR CRP Antineutrophil cytoplasmic antibody (ANCA)**

**Neurovascular syphilis --Syphilis serology , SLE-- Antinuclear antibodies**

The patient's neurological deficits may worsen during the first few hours or days after their onset.

**1-extension** of the area of infarction..**2- hemorrhage** into it  
**3-or** the development of **edema** with consequent mass effect.

It is important to distinguish such patients from those who are deteriorating as a result of complications such as **hypoxia, sepsis, epileptic seizures or metabolic abnormalities**



# TREATMENT

**Airway Check** that the patient can protect his/her airway and swallow without evidence of aspiration

Perform a swallow screen and keep patient nil by mouth if swallowing unsafe

**Breathing Check** that the patient is breathing adequately; check oxygen saturation and give oxygen if saturation < 95%

**Circulation Check** peripheral perfusion, pulse and blood pressure adequate and treat with fluid replacement, anti-arrhythmics and inotropic drugs as appropriate

**Hydration Screen** for signs of dehydration and give fluids parenterally or by nasogastric tube if necessary

**Nutrition Assess** nutritional status and provide nutritional supplements if necessary ,if dysphagia persists for a day or two, start feeding via a nasogastric tube

Blood pressure **do not lower the blood pressure in the first week** unless there is

1. Unless there is heart failure or renal failure, evidence of hypertensive encephalopathy or aortic dissection (end organ damage)
2. Or systolic BP >220 mmHg or diastolic BP >120mmHg

since cerebral perfusion may decrease. Blood pressure often returns towards the patient's normal level within the first few days

**Blood glucose** Check blood glucose and treat with insulin when levels are  $\geq 11.1$  mmol/L (200 mg/dL). Monitor closely to avoid hypoglycemia

**Temperature** Check for pyrexia and investigate and treat underlying cause

**Pressure areas** Check pressure areas and introduce measures to reduce the risk of bed sores, treat infection, maintain nutrition, Provide a pressure-relieving mattress, turn immobile patients regularly

**Incontinence** Check for constipation and urinary retention and treat appropriately, avoid urinary catheterisation unless the patient is in acute urinary retention or incontinence is threatening

## THROMBOLYSIS IN ACUTE ISCHEMIC STROKE

rt-PA increases the risk of fatal intracranial hemorrhage, but this risk is offset by an improvement in longer-term outcome amongst survivors. The maximum benefit appears to be when thrombolysis is given **within 3 hours of onset**.

In the absence of contraindications, **aspirin (300 mg daily) should be started immediately** after an ischemic stroke **unless rt-PA has been given**, in which case it should **be withheld for at least 24 hours**.

# COMPLICATION PREVENTION TREATMENT

**Chest infection** Nurse semi-erect, a void aspiration (nil by mouth, nasogastric tube, possible gastrectomy)  
Antibiotics, Physiotherapy

Epileptic **seizures** Maintain cerebral oxygenation, Avoid metabolic disturbance Anticonvulsants

**Deep venous thrombosis/pulmonary embolism** Maintain hydration, Early mobilization  
Anti-embolism stockings, Heparin (for high-risk patients only) Anticoagulation (exclude hemorrhagic stroke first)

**Painful shoulder** Avoid traction injury, Shoulder/arm supports, Physiotherapy Physiotherapy  
Local corticosteroid injections

**Pressure sores** Frequent turning, Monitor pressure areas, Avoid urinary damage to skin Nursing care,  
Pressure-relieving mattress

**Urinary infection** Avoid catheterisation if possible, Use penile sheath Antibiotics

**Constipation** Appropriate aperients and diet Appropriate aperients

**Depression and anxiety** Maintain positive attitude and provide information Antidepressants



## 2<sup>ND</sup> PREVENTION

**Blood pressure** lowering in secondary prevention of stroke .

Lowering blood pressure even in the 'normal range' reduces the risk of recurrent stroke, myocardial infarction and vascular deaths in patients who have suffered a stroke.

**Antiplatelet** drugs in secondary prevention of ischaemic stroke ( aspirin, clopidogrel or a combination of aspirin and dipyridamole ) .

**Statins** in secondary prevention of ischaemic stroke .

In patients with ischaemic stroke, statins reduce the risk of recurrent stroke, myocardial infarction and vascular deaths.

### **NOTE:**

Anticoagulants in secondary prevention of ischemic stroke 'There is no net benefit to be gained in the routine use of anticoagulants after acute stroke except in the presence of AF.

# CAROTID ARTERY ENDARTERECTOMY /STENTING

- If the carotid artery stenosis in the affected side is greater than 70%(by Doppler US or CTA)
- It is marginal benefit for symptomatic with 50-69%
- It is less benefit for asymptomatic patients even with greater than 60%

# PREVENTION

The best way to help prevent a stroke is to eat a healthy diet, exercise regularly, and avoid smoking and drinking too much alcohol.

These lifestyle changes can reduce your risk of problems like:

- arteries becoming clogged with fatty substances (atherosclerosis)
- high blood pressure
- high cholesterol levels
- If you have already had a stroke, making these changes can help reduce your risk of having another stroke in the future.

# Diet

- An unhealthy diet can increase your chances of having a stroke because it may lead to an increase in your blood pressure and cholesterol levels.
- A low-fat, high-fibers diet is usually recommended, including plenty of fresh fruit and vegetables and wholegrains.
- Ensuring a balance in your diet is important. Do not eat too much of any single food, particularly foods high in salt and processed foods.
- You should limit the amount of salt you eat to no more than **6g** a day as too much salt will increase your blood pressure: 6g of salt is about 1 teaspoonful.



# Exercise

- Combining a healthy diet with regular exercise is the best way to maintain a healthy weight.
- Regular exercise can also help lower your cholesterol and keep your blood pressure healthy.
- For most people, at least **150 minutes** (2 hours and 30 minutes) of moderate-intensity aerobic activity, such as cycling or fast walking, every week is recommended.
- Regular exercise may not be possible in the first weeks or months after a stroke, but you should be able to begin exercising once your rehabilitation has progressed.

# Stop smoking

- Smoking significantly increases your risk of having a stroke. This is because it narrows your arteries and makes your blood more likely to clot.
- You can reduce your risk of having a stroke by stopping smoking.
- Stopping smoking will also improve your general health and reduce your risk of developing other serious conditions, such as lung cancer and heart disease.

# Managing underlying conditions

- If you have been diagnosed with a condition known to increase your risk of stroke, ensuring the condition is well controlled is also important for helping prevent strokes.
- The lifestyle changes mentioned above can help control these conditions to a large degree, but you may also need to take regular medication.
- [treating atrial fibrillation](#)
- [treating high blood pressure](#)
- [treating high cholesterol](#)
- [treating type 1 diabetes](#) and [treating type 2 diabetes](#)

# CEREBRAL VASCULAR ACCIDENT (CVA) "BRAIN ACCIDENT"

- HEADACHE
- MENTAL CHANGES
  - CONFUSION
  - DISORIENTATION
  - MEMORY IMPAIRMENT
- APHASIA (CVA LEFT HEMISPHERE)
- RESP PROBLEMS (↓ NEURO MUSCULAR CONTROL)
- ↓ COUGH / SWALLOW REFLEX
- AGNOSIA (↓ SENSORY INTERPRETATION)
- INCONTINENCE
- SEIZURES

- TIA:
- HEADACHE
  - CONFUSION
  - VERTIGO
  - DYSARTHRIA
  - TRANSIENT HEMIPARESIS
  - TEMPORARY VISION CHANGES
  - SYNCOPE



- HEMIPARESIS OR HEMIPLEGIA
- HYPERTHERMIA
- EMOTIONAL LABILITY
- VISUAL CHANGES (HOMONYMOUS HEMIANOPSIA)



HORNER'S SYNDROME

- VOMITING
- PERCEPTUAL DEFECTS (CVA RIGHT HEMISPHERE)
- HYPERTENSION
- APRAXIA (↓ LEARNED MOVEMENTS)

- FOCAL NEUROLOGIC SIGS:
- PARALYSIS
  - SENSORY LOSS
  - LANGUAGE DISORDER
  - REFLEX CHANGES

# Thanks