

Cerebrovascular Disorders

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TARGET: **STROKE**

TIME LOST IS **BRAIN LOST.**

GOAL: REDUCE DTN TIMES TO 60 MINUTES OR LESS
IN ELIGIBLE ISCHEMIC STROKE PATIENTS



Stroke

- Ischemia is inadequate blood flow
- Occurs when ischemia to part of the brain results in death of brain cells


Stroke MANIFESTATIONS,

- Movement, sensation, or emotions controlled by affected area are lost or impaired
- Loss of function varies with location and extent of damage

■ Paramedics are encouraged to make the diagnosis of stroke on a simple history and examination

**SPOT A STROKE
- FAST -**


F **FACE**
Ask the person to smile.
Does one side of the face droop?



A **ARMS**
Ask the person to raise both arms.
Does one arm drift downward?







S **SPEECH**
Ask the person to repeat a simple phrase.
Is their speech slurred or strange?



T **TIME**
If you observe any of these signs,
call 9-1-1 immediately!



STROKE is an Emergency.
Every minute counts.
ACT F.A.S.T!

	F FACE	Does one side of the face droop? Ask the person to smile.
	A ARMS	Is one arm weak or numb? Ask the person to raise both arms. Does one arm drift downward?
	S SPEECH	Is speech slurred? Ask the person to repeat a simple sentence. Is the sentence repeated correctly?
	T TIME	If the person shows any of these symptoms, Call 911 or get to the hospital immediately.

Risk Factors

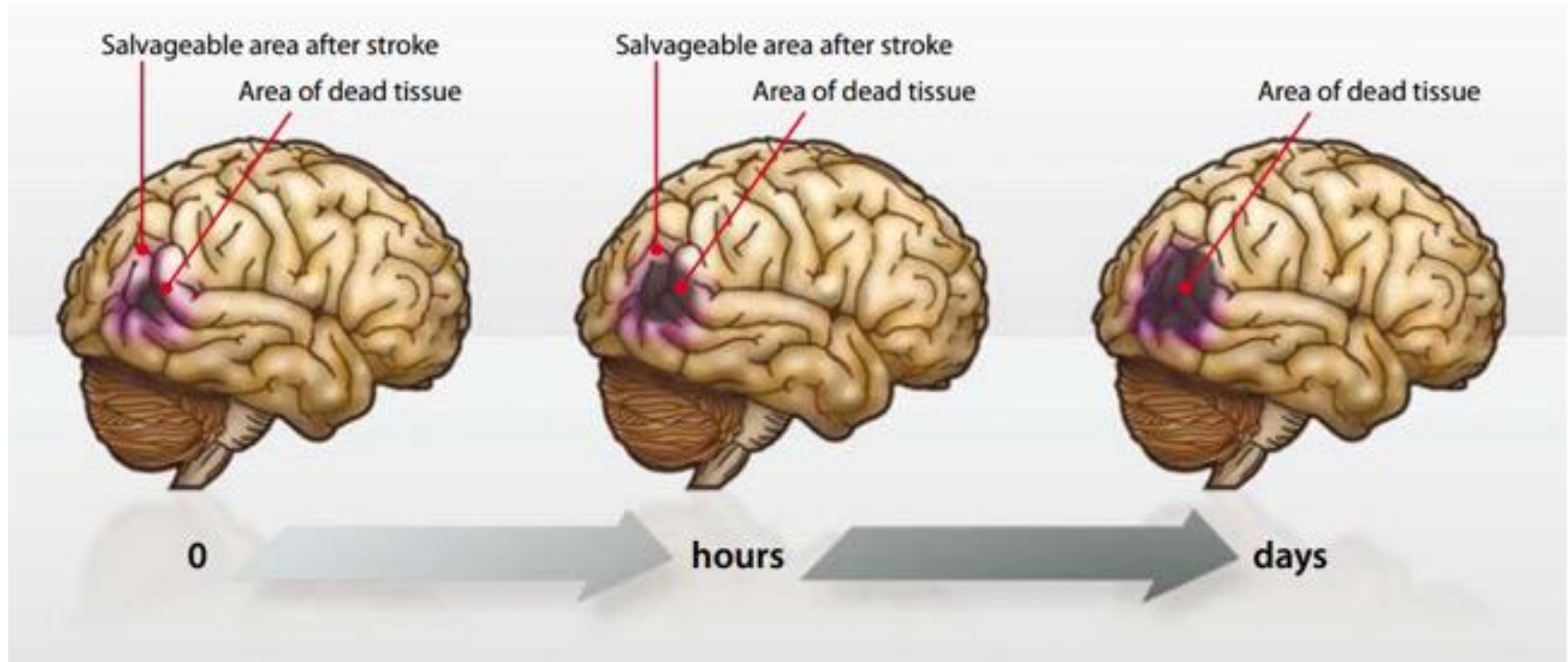
Non modifiable

- Age
- Gender (women more likely to die)
- Race (African)
- Heredity

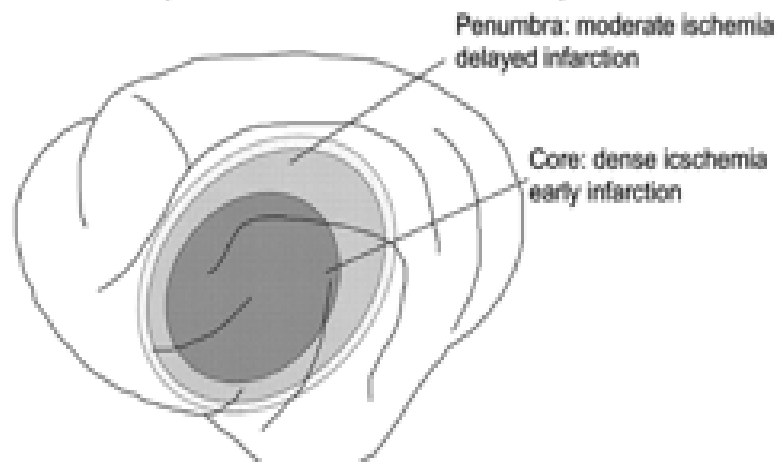
Risk Factors

Modifiable

- Asymptomatic carotid stenosis
- Diabetes mellitus
- Heart disease, *atrial fibrillation*
- Hyperlipidemia
- Hypertension
- Obesity
- Oral contraceptive use
- Sickle cell disease
- Smoking



Compartments of Infarct Development



Etiology and Pathophysiology

- Brain requires continuous supply of O₂

and glucose for neurons to function

- If blood flow is interrupted

- Neurologic metabolism is altered in 30 seconds

- Metabolism stops in 2 minutes

- Cell death occurs in 5 minutes

Blockage of one blood vessel will cause ischemia within 5 minutes

Time	Neurons Lost	Synapses Lost	Myelinated fibers Lost	Premature Aging
1 second	32,000	230 million	200 m	8.7 hours
1 minute	1.9 million	14 billion	12 km	3.1 weeks
1 hour	120 million	830 billion	714 km	3.6 years
Complete	1.2 billion	8.3 trillion	7140 km	36 years

TIME IS BRAIN!

STROKE



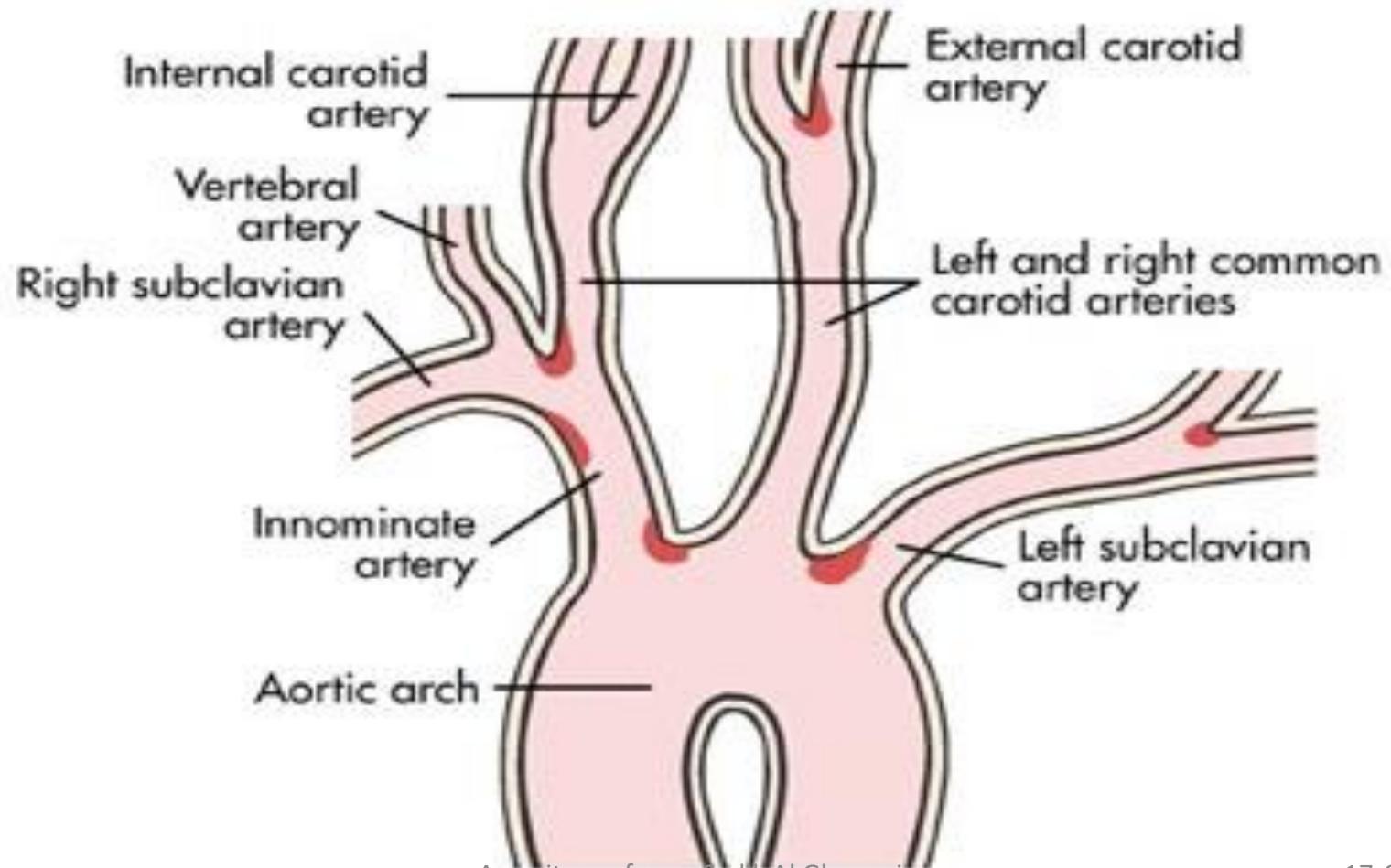
Time lost is Brain lost

Saver JL, Stroke 2006

Etiology and Pathophysiology

■ Atherosclerosis is a major cause of stroke

- Can lead to thrombus formation and contribute to emboli



Etiology and Pathophysiology cont

- Around the core area of ischemia is a border zone of reduced blood flow where ischemia is potentially reversible

- If adequate blood flow can be restored early (<3 hours) and the ischemic cascade can be interrupted
 - less brain damage and less neurologic function lost

Transient Ischemic Attacks (TIA)

- Temporary focal loss of neurologic function caused by ischemia (analogous to angina in CAD)
- Most resolve within 3 hours
- May be due to micro-emboli that temporarily block blood flow
- A warning sign of progressive cerebrovascular disease

No signs of acute infarction on brain imaging.

Types of Stroke

■ Classification based on underlying pathophysiologic findings

– Ischemic

1- Thrombotic

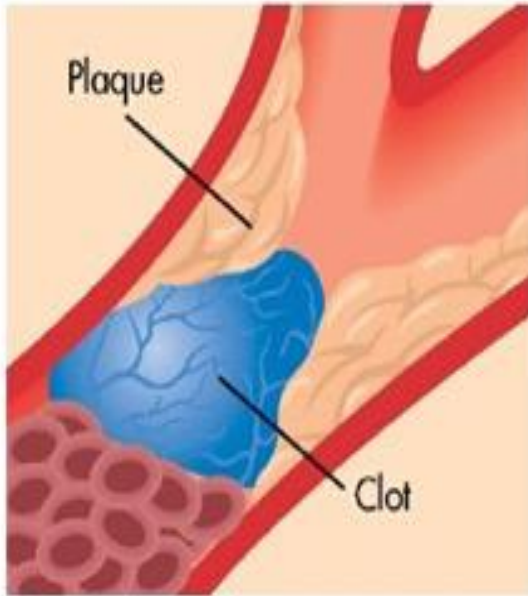
2- Embolic

–

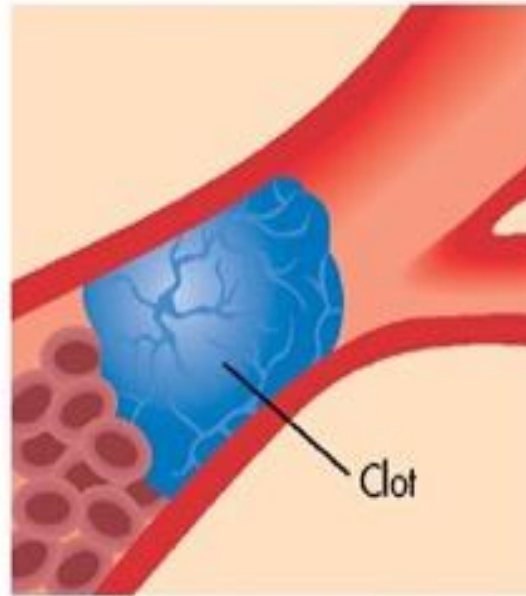
Hemorrhagic

Major Types of Stroke

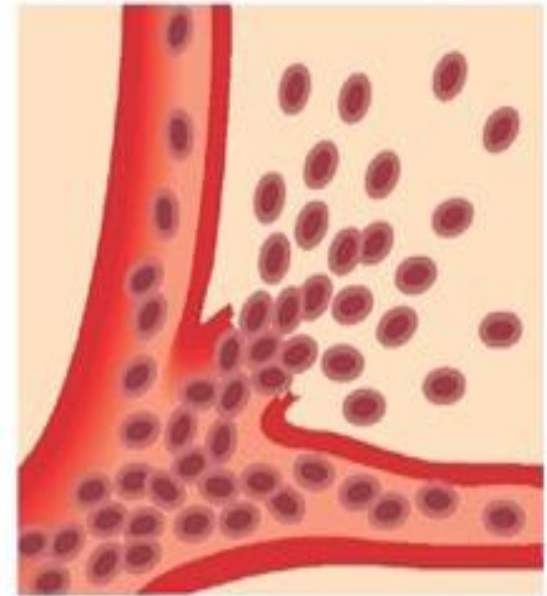
A



B



C



Thrombotic stroke. Cerebral thrombosis is a narrowing of the artery by fatty deposits called *plaque*. Plaque can cause a clot to form, which blocks the passage of blood through the artery.

Embolic stroke. An embolus is a blood clot or other debris circulating in the blood. When it reaches an artery in the brain that is too narrow to pass through, it lodges there and blocks the flow of blood.

Hemorrhagic stroke. A burst blood vessel may allow blood to seep into and damage brain tissues until clotting shuts off the leak.

Ischemic Stroke

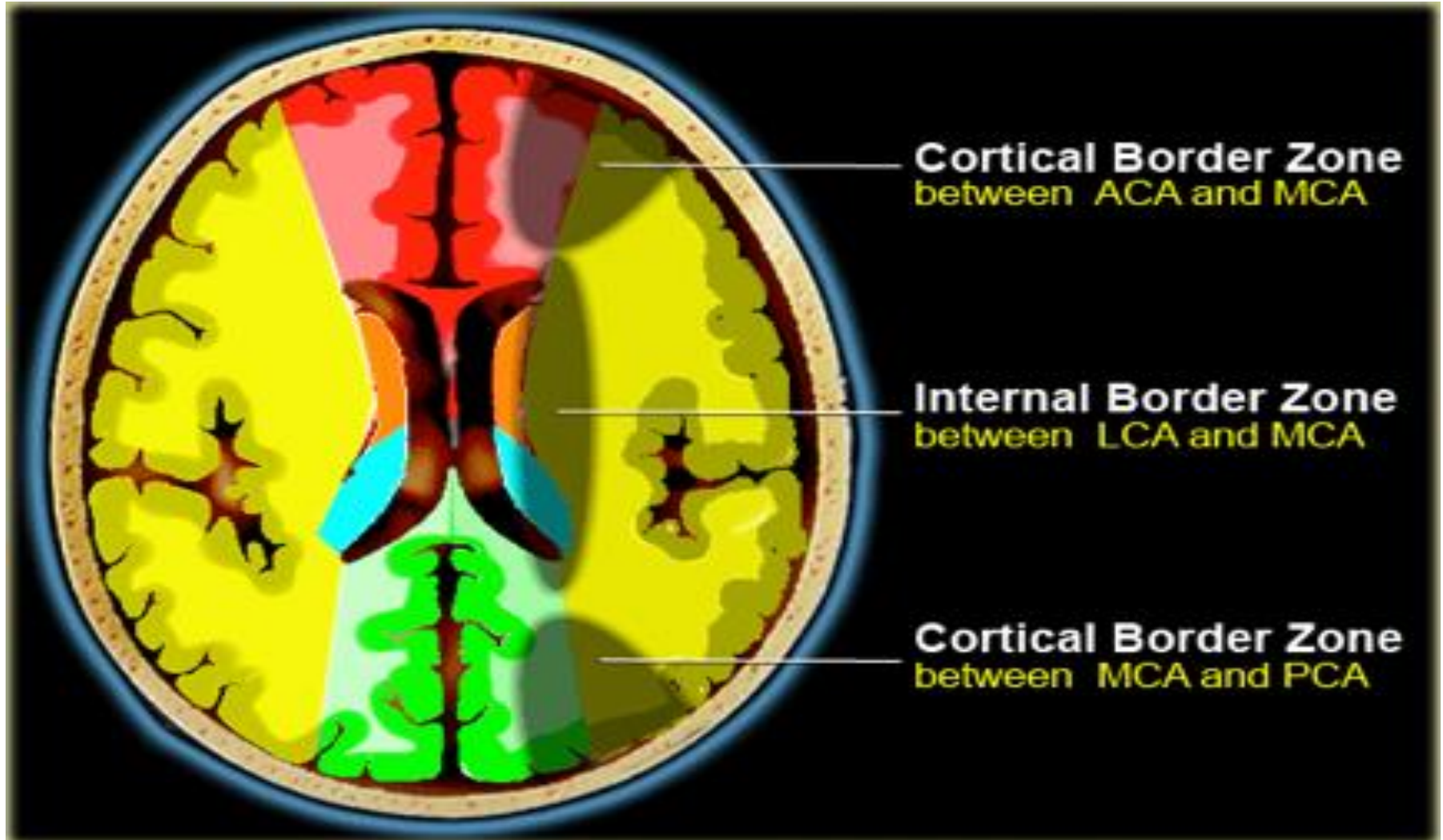
■ Result of inadequate blood flow to brain due to partial or complete occlusion of an artery

1■ Constitute 85% of all strokes

2■ Most patients with ischemic stroke do not have a decreased level of consciousness in the first 24 hours

3■ Symptoms often worsen during first 72 hours d/t cerebral edema

Ischemic Stroke



Ischemic Stroke

■ Thrombotic stroke

– Thrombosis occurs in relation to injury to a blood vessel wall → blood clot

1– Result of thrombosis or narrowing of the blood vessel

2– Most common cause of stroke

Ischemic Stroke cont

■ Thrombotic stroke

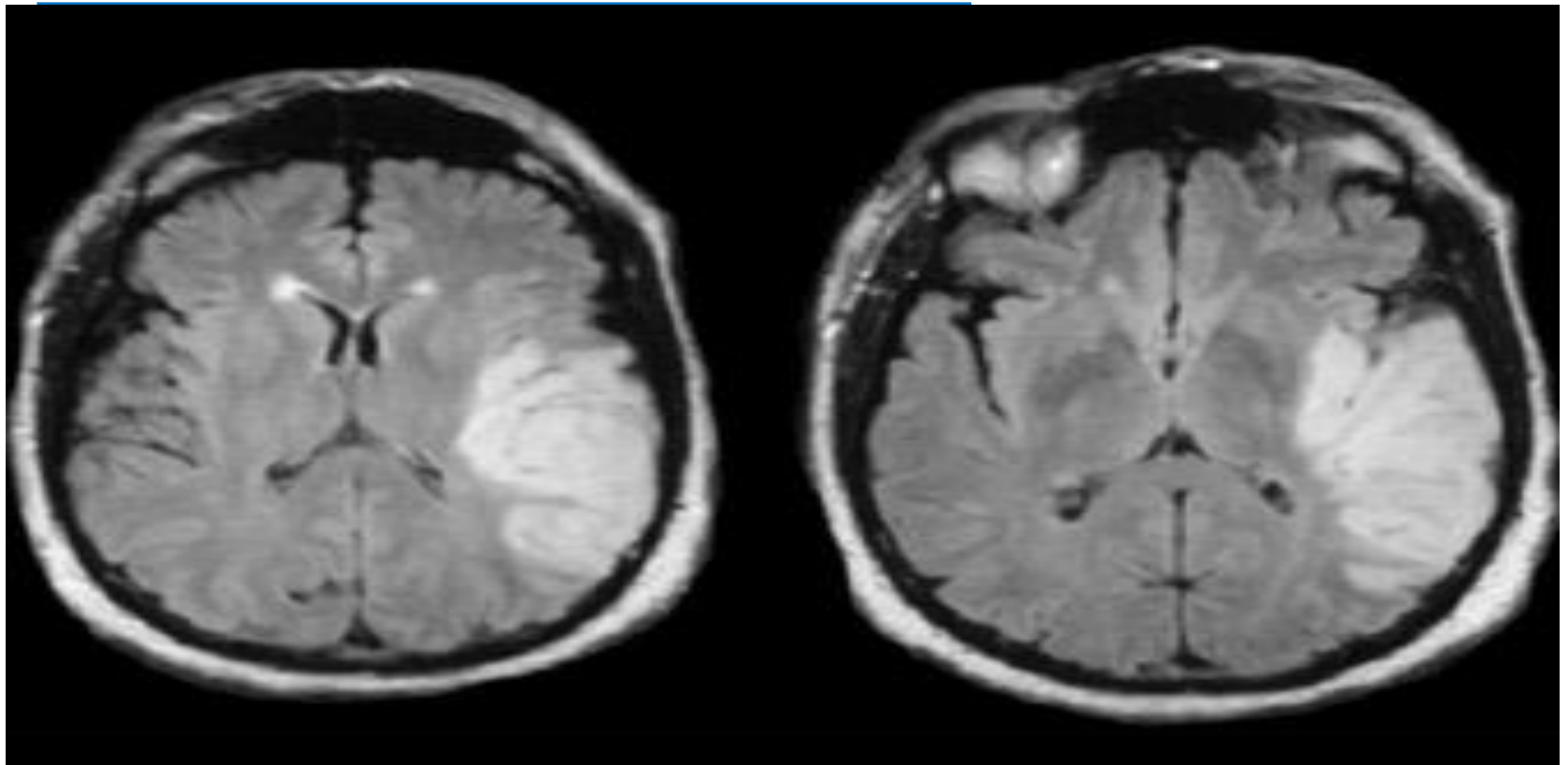
1– Two-thirds are associated with HTN and diabetes

2– Often preceded by a TIA

Ischemic Stroke

■ Embolic stroke

- Embolus lodges in and occludes a cerebral artery
- Results in infarction and edema of the area supplied by that vessel
- Second most common cause of stroke



Ischemic Stroke

■ Embolic stroke

1– Majority of emboli originate in heart, with plaque breaking off from the endocardium and entering circulation

2– Associated with sudden, rapid occurrence of severe clinical symptoms

Ischemic Stroke cont

■ Embolic stroke

3– Patient usually remains conscious although may have a headache

4– Recurrence is common unless the underlying cause is aggressively treated

Hemorrhagic Stroke

1-■ Account for approximately 15% of all Strokes

2-■ Result from bleeding into the brain tissue (ICH) itself or into the subarachnoid space (SAH) or ventricles (IVH)

Hemorrhagic Stroke

■ Intracerebral hemorrhage (ICH)

1– Bleeding within the brain caused by a rupture of a vessel

2– Hypertension is the most important cause

3– Commonly occurs during activity

Hemorrhagic Stroke CONT

■ Intracerebral hemorrhage(ICH)

4–Often a sudden onset of symptoms that progress over minutes to hours b/c of ongoing bleeding

5– Manifestations include neurologic deficits, headache, decreased levels of consciousness, and HTN

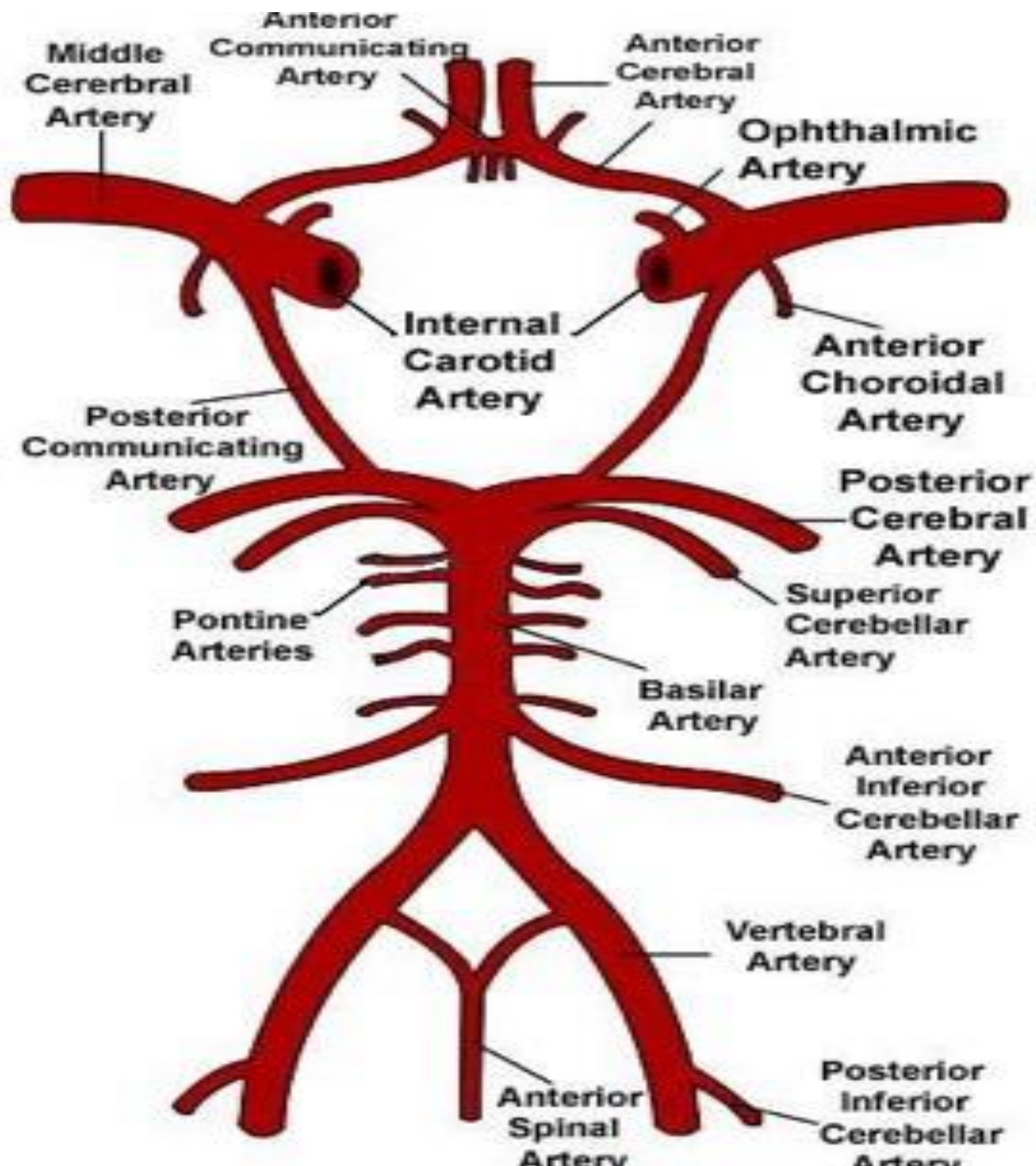
Hemorrhagic Stroke (cont)

■ Subarachnoid hemorrhage(SAH)

1– Bleeding into cerebrospinal space between the arachnoid and pia mater

2– Commonly caused by rupture of a cerebral aneurysm

- Circle of Willis
- Anterior circulation
- Posterior circulation



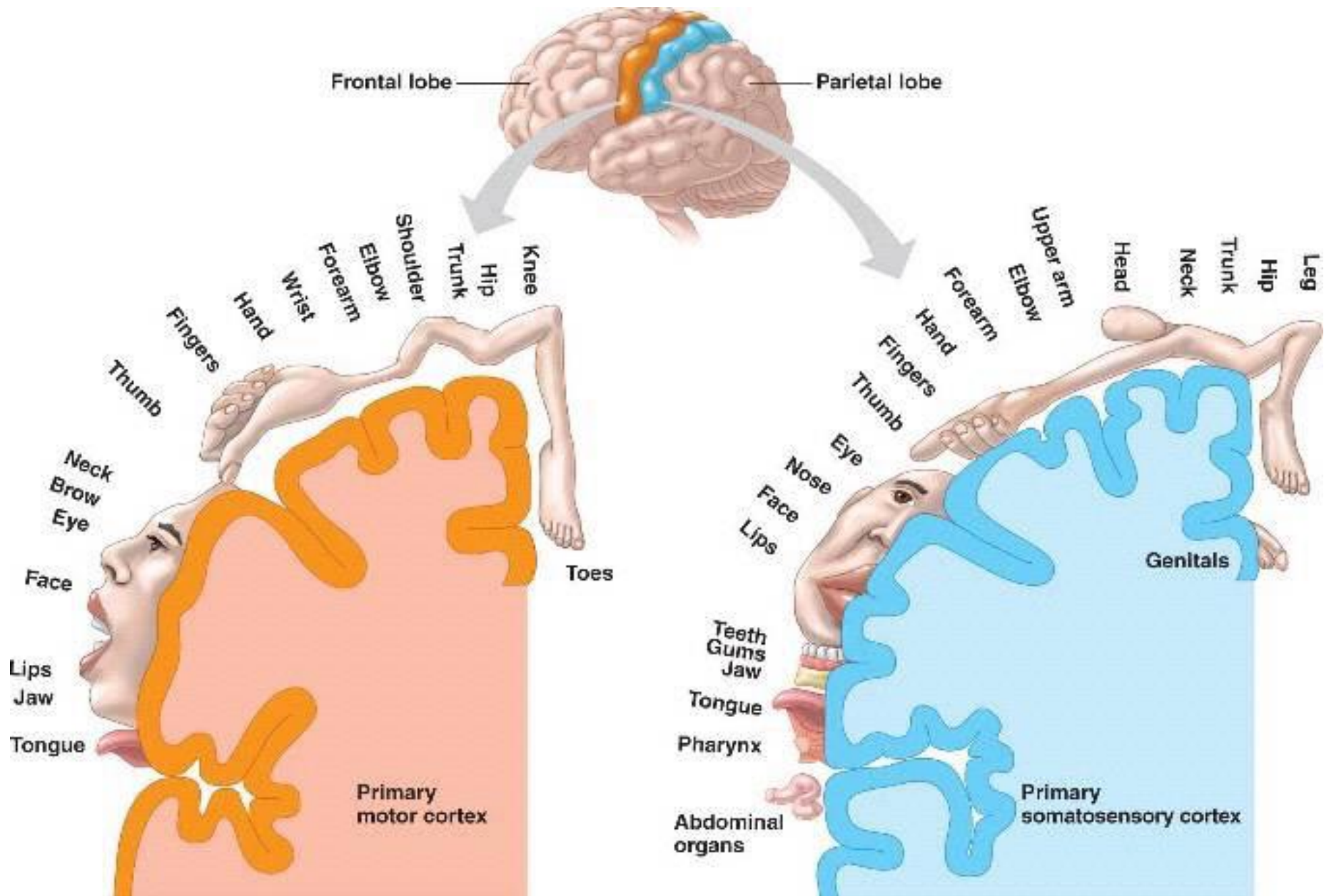
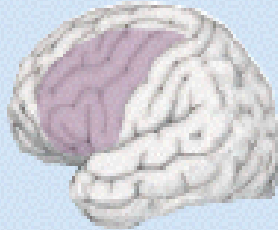


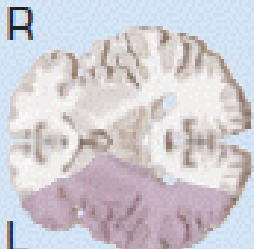
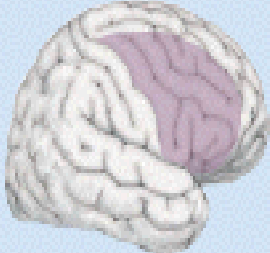
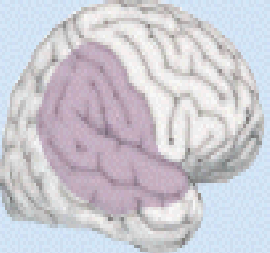
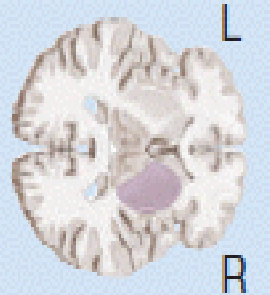



TABLE 10.1 Major Clinical Syndromes of the MCA, ACA, and PCA Territories

LOCATION OF INFARCT	AFFECTED TERRITORY	DEFICITS ^a
Left MCA superior division		Right face and arm weakness of the upper motor neuron type and a nonfluent, or Broca's, aphasia. In some cases there may also be some right face and arm cortical-type sensory loss.
Left MCA inferior division		Fluent, or Wernicke's, aphasia and a right visual field deficit. There may also be some right face and arm cortical-type sensory loss. Motor findings are usually absent, and patients may initially seem confused or crazy but otherwise intact, unless carefully examined. Some mild right-sided weakness may be present, especially at the onset of symptoms.
Left MCA deep territory		Right pure motor hemiparesis of the upper motor neuron type. Larger infarcts may produce "cortical" deficits, such as aphasia as well.
Left MCA stem		Combination of the above, with right hemiplegia, right hemianesthesia, right homonymous hemianopia, and global aphasia. There is often a left gaze preference, especially at the onset, caused by damage to left hemisphere cortical areas important for driving the eyes to the right.

LOCATION OF INFARCT	AFFECTED TERRITORY	DEFICITS ^a
Right MCA superior division		<p>Left face and arm weakness of the upper motor neuron type. Left hemineglect is present to a variable extent. In some cases, there may also be some left face and arm cortical-type sensory loss.</p>
Right MCA inferior division		<p>Profound left hemineglect. Left visual field and somatosensory deficits are often present; however, these may be difficult to test convincingly because of the neglect. Motor neglect with decreased voluntary or spontaneous initiation of movements on the left side can also occur. However, even patients with left motor neglect usually have normal strength on the left side, as evidenced by occasional spontaneous movements or purposeful withdrawal from pain. Some mild, left-sided weakness may be present. There is often a right gaze preference, especially at onset.</p>
Right MCA deep territory		<p>Left pure motor hemiparesis of the upper motor neuron type. Larger infarcts may produce “cortical” deficits, such as left hemineglect as well.</p>
Right MCA stem		<p>Combination of the above, with left hemiplegia, left hemianesthesia, left homonymous hemianopia, and profound left hemineglect. There is usually a right gaze preference, especially at the onset, caused by damage to right hemisphere cortical areas important for driving the eyes to the left.</p>

Left ACA



Right leg weakness of the upper motor neuron type and right leg cortical-type sensory loss. Grasp reflex, frontal lobe behavioral abnormalities, and transcortical aphasia can also be seen. Larger infarcts may cause right hemiplegia.

Right ACA



Left leg weakness of the upper motor neuron type and left leg cortical-type sensory loss. Grasp reflex, frontal lobe behavioral abnormalities, and left hemineglect can also be seen. Larger infarcts may cause left hemiplegia.

Left PCA



Right homonymous hemianopia. Extension to the splenium of the corpus callosum can cause alexia without agraphia. Larger infarcts, including the thalamus and internal capsule, may cause aphasia, right hemisensory loss, and right hemiparesis.

Right PCA



Left homonymous hemianopia. Larger infarcts including the thalamus and internal capsule may cause left hemisensory loss and left hemiparesis.

Clinical Manifestations of Stroke

■ Affects many body functions

1■ Motor activity

2■ sensory function

3■ Intellectual function

4■ Spatial-perceptual alterations

5■ Personality

a■ Affection

b■ Sensation

c■ Communication

Clinical Manifestations cont

Motor Function

1-■ Most obvious effect of stroke

2■ Can include impairment of

a– Mobility

b– Respiratory function

c– Swallowing and speech

d– Gag reflex

e– Self-care abilities

Clinical Manifestations cont

Motor Function

■ Characteristic motor deficits (contralateral)

1– Loss of skilled voluntary movement

2– Impairment of integration of movements

3– Alterations in muscle tone (flaccid → spastic)

4– Alterations in reflexes (hypo → hyper)

Clinical Manifestations cont

Communication

■ Patient may experience aphasia when stroke damages the dominant hemisphere of the brain

1– Aphasia: total loss of comprehension and use of language

2– Dysphasia: difficulty with comprehension and use of language

■ Classified as non fluent or fluent

Clinical Manifestations cont

Communication

■ Dysarthria (dys-Articulation)

1– Disturbance in the muscular control of speech

2– Impairments in pronunciation, articulation, and phonation; NOT meaning or comprehension

Clinical Manifestations cont

Affection

1■ May have difficulty controlling their Emotions

2■ Emotional responses may be exaggerated or unpredictable

3■ Depression , impaired body image and loss of function can make this worse

4■ May be frustrated by mobility and communication problems

Clinical Manifestations cont

Intellectual Function

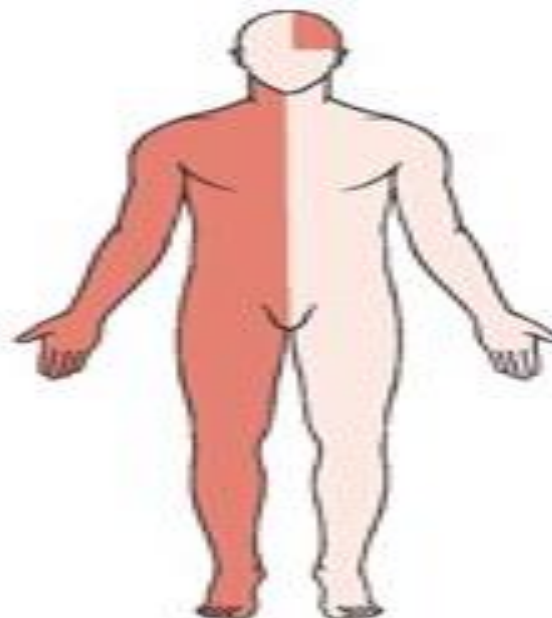
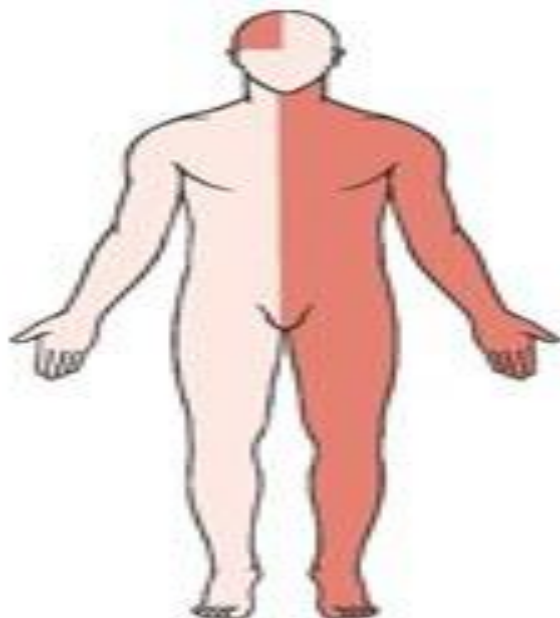
1■ Memory and judgment may be impaired

2■ Left-brain stroke: more likely to result in memory problems related to language Clinical Manifestations

3■ Memory and judgment may be impaired

4■ Left-brain stroke: more likely to result

Manifestations of Right-Brain and Left-Brain Stroke



Right-brain damage (stroke on right side of the brain)

- Paralyzed left side: hemiplegia
- Left-sided neglect
- Spatial-perceptual deficits
- Tends to deny or minimize problems
- Rapid performance, short attention span
- Impulsive, safety problems
- Impaired judgment
- Impaired time concepts

Left-brain damage (stroke on left side of the brain)

- Paralyzed right side: hemiplegia
- Impaired speech/language aphasia
- Impaired right/left discrimination
- Slow performance, cautious
- Aware of deficits: depression, anxiety
- Impaired comprehension related to language, math

Clinical Manifestations cont

Spatial-Perceptual Alterations

- 1■ Stroke on the right side of the brain is more likely to cause problems in spatial perceptual orientation
- 2■ However, this may occur with left-brain stroke

Clinical Manifestations cont

Spatial-Perceptual Alterations

3■ Spatial-perceptual problems may be divided into four categories

a. Incorrect perception of self and illness (may deny illness or body parts)

b. Erroneous perception of self in space (e.g., neglect all input from affected side; distance judgment

Clinical Manifestations cont

Spatial-Perceptual Alterations

4. Inability to recognize an object by sight, touch, or hearing

5. Inability to carry out learned sequential movements on command

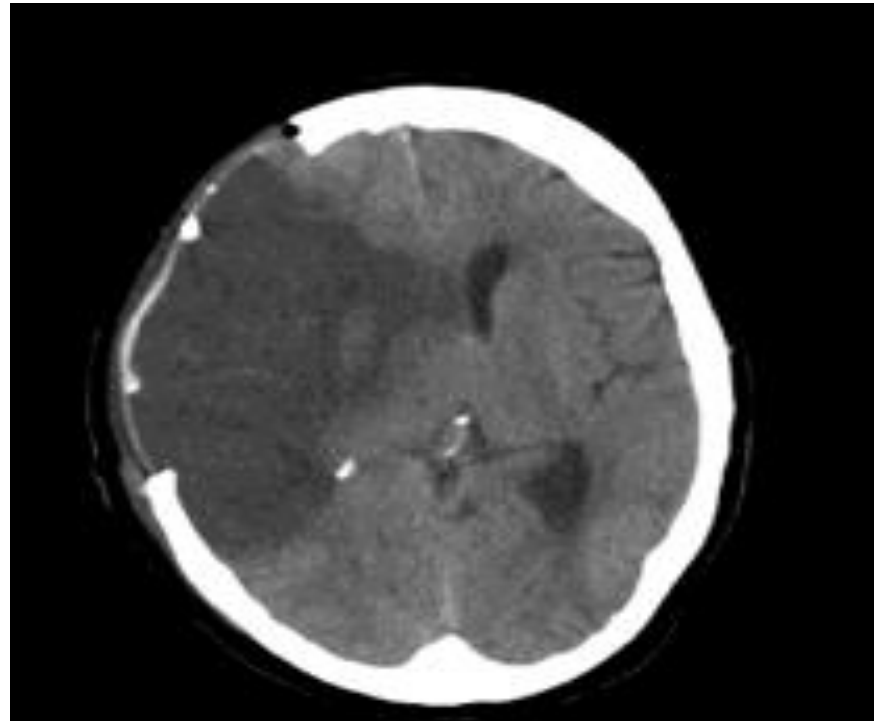
Diagnostic Studies

1■ When symptoms of a stroke occur, diagnostic studies are done to

a– Confirm that it is a stroke

b– Identify the likely cause of the stroke

2■ CT is the primary diagnostic test used after a stroke



Collaborative Care

Prevention

1 ■ Education and management of modifiable risk factors to prevent a stroke

2 ■ Close management of patients with known risk factors

Collaborative Care cont

Prevention

A, B, C, D

- A: Antithrombotic/ Anticoagulation

Aspirin, Clopidogrel, Dipyridamol+Aspirin (Aggrenox), Ticlopidine.

Warfrin, New anticoagulants.

- B: Blood pressure control

- C: Cholesterol lowering medications; Carotid revascularization

LDL < 70%

For patient symptomatic carotid stenosis

- D: DM control

Collaborative Care cont

Prevention

- **Antiplatelet drugs (usually Aspirin) to prevent stroke in those with history of TIA**

Collaborative Care con Prevention

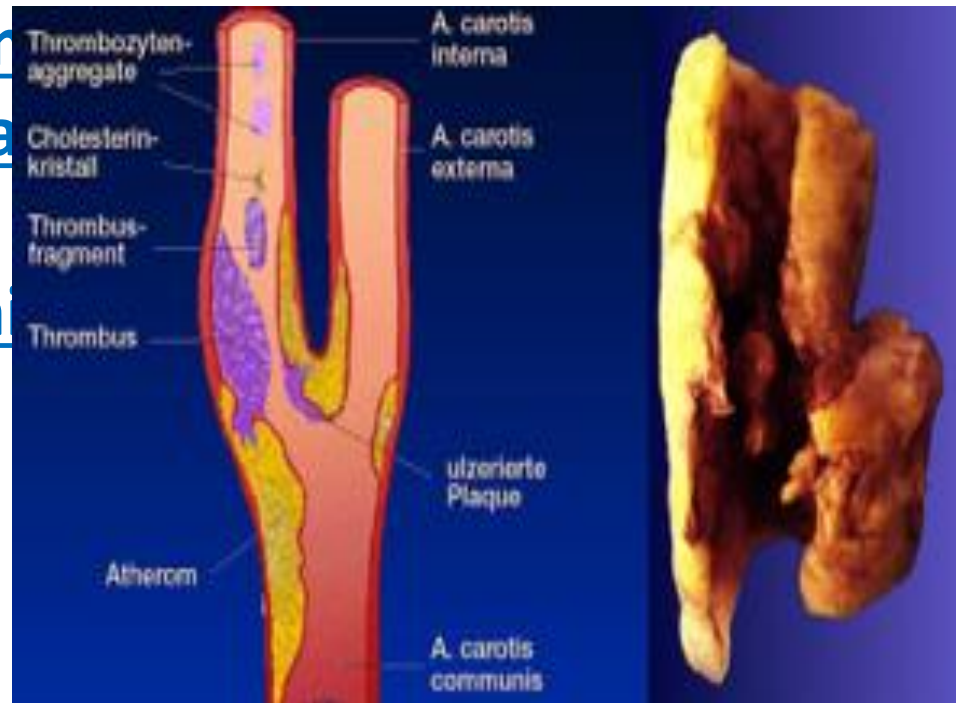
■ Surgical interventions for those with TIAs from carotid disease:

1– Carotid endarterectomy

2– Transluminal angioplasty

3– Stenting

3– Extracranial-intracranial



Collaborative Care cont

Acute Care

■ Assessment findings

- 1– Altered level of consciousness (See GCS)
- 2– Weakness, numbness, or paralysis
- 3– Speech or visual disturbances
- 4– Severe headache
- 5– ↑ or ↓ heart rate
- 6– Respiratory distress
- 7– Unequal pupils

Collaborative Care cont

Acute Care

■ Assessment findings

1– Hypertension

2– Facial drooping on affected side

3– Difficulty swallowing

4– Seizures

5– Bladder or bowel incontinence

6– Nausea and vomiting

7– Vertigo

Collaborative Care cont

Acute Care

■ Interventions – Initial: ABC

- 1– Ensure patient airway
- 2– Remove dentures
- 3– Perform pulse oximetry
- 4– Maintain adequate oxygenation
- 5– IV access
- 6– Maintain BP according to guidelines

■ (treat if SBP > 220 or MAP > 130)

Collaborative Care cont

Acute Care

■ Interventions – Initial

1– Immediate CT scan to determine cause
(ischemic vs hemorrhagic)

2– Measures to control ICP

■ Head & neck in alignment (avoid flexion)

■ Elevate HOB 30 ° if no symptoms of shock or injury

■ Avoid hip, knee flexion

■ Pain management, diuretics if needed

Collaborative Care cont

Acute Care

■ Interventions – Initial

1– Institute seizure precautions

2– Avoid hyperthermia (↑s cerebral metabolism)

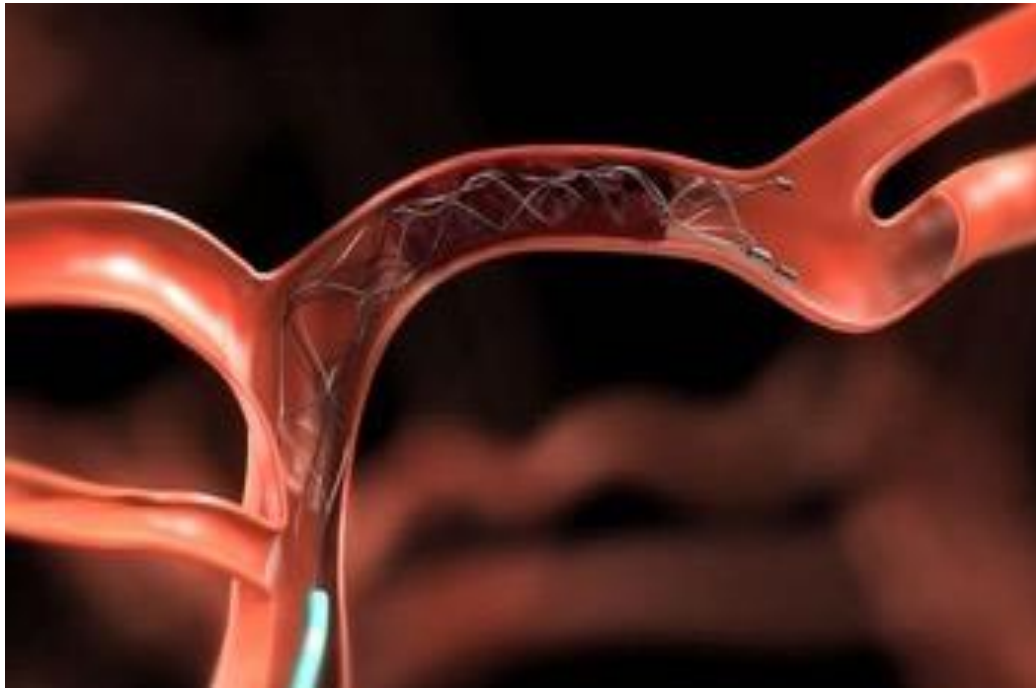
3– Anticipate thrombolytic/fibrinolytic therapy for ischemic stroke

Collaborative Care cont

Acute Care

■ Thrombolytic/fibrinolytic therapy with recombinant tissue plasminogen activator (tPA) is used to,

– Reestablish blood flow and prevent cell death in patients of ischemic stroke



Collaborative Care cont

Acute Care

■ Thrombolytic/fibrinolytic therapy given within 4,5 hours of the onset of symptoms,

1– ↓ disability

2– But at the expense of ↑ in deaths within the first 7 to 10 days and ↑ in intracranial hemorrhage

Collaborative Care cont

Acute Care

- **For ischemic strokes (24 hr after tPA):**

- 1– Antiplatelets**

- 2– Anticoagulants (Heparin, coumadin)**

- **Must maintain therapeutic levels**

- PTT, INR**

Collaborative Care cont

Acute Care

- Interventions – Ongoing
- Monitor vital signs and neurologic status
- 1■ Level of consciousness
- 2■ Motor and sensory function
- 3■ Pupil size and reactivity
- 4■ O₂ saturation
- 5■ Cardiac rhythm

Collaborative Care cont

Acute Care

Note

- Approximately 10-15% of patients who experience a stroke will have seizures, usually within 24 hours

Collaborative Care cont

Acute Care

■ Surgical interventions:

1– Immediate evacuation of hematomas that result from hemorrhagic stroke

2– Clip, wrap or coil aneurysm to prevent rebleed

Collaborative Care cont

Rehabilitation Care

- **After the stroke has stabilized for 12-24 hours, collaborative care shifts from preserving life to lessening disability and attaining optimal functioning**

Nursing Management Planning

■ Goals

- 1– Maintain a stable or improved level of consciousness
- 2– Attain maximum physical functioning
- 3– Attain maximum self-care abilities and skills
- 4– Maximize communication abilities

Take Home Messages

- 1■ Stroke is the commonest cause of death in developed countries.
- 2■ Hypertension is the most treatable risk factor.
- 3■ Thromboembolic infarction (80%), cerebral and cerebellar haemorrhage (10%) and subarachnoid haemorrhage (about 5%) are the major cerebrovascular problems.



Take Home Messages



Time is brain

