Cerebrovascular Accident

CVA

Cerebrovascular Accident

- **Results from ischemia to a part of the brain or hemorrhage into the brain that results in death of brain cells.**

- **Approximately 750,000 in USA annually**
  - Third most common cause of death
  - **#1 leading cause of disability**
  - 25% with initial stroke die within 1 year
  - 50-75% will be functionally independent
  - 25% will live with permanent disability

- **Physical, cognitive, emotional, & financial impact**

Cerebrovascular Accident Risk Factors

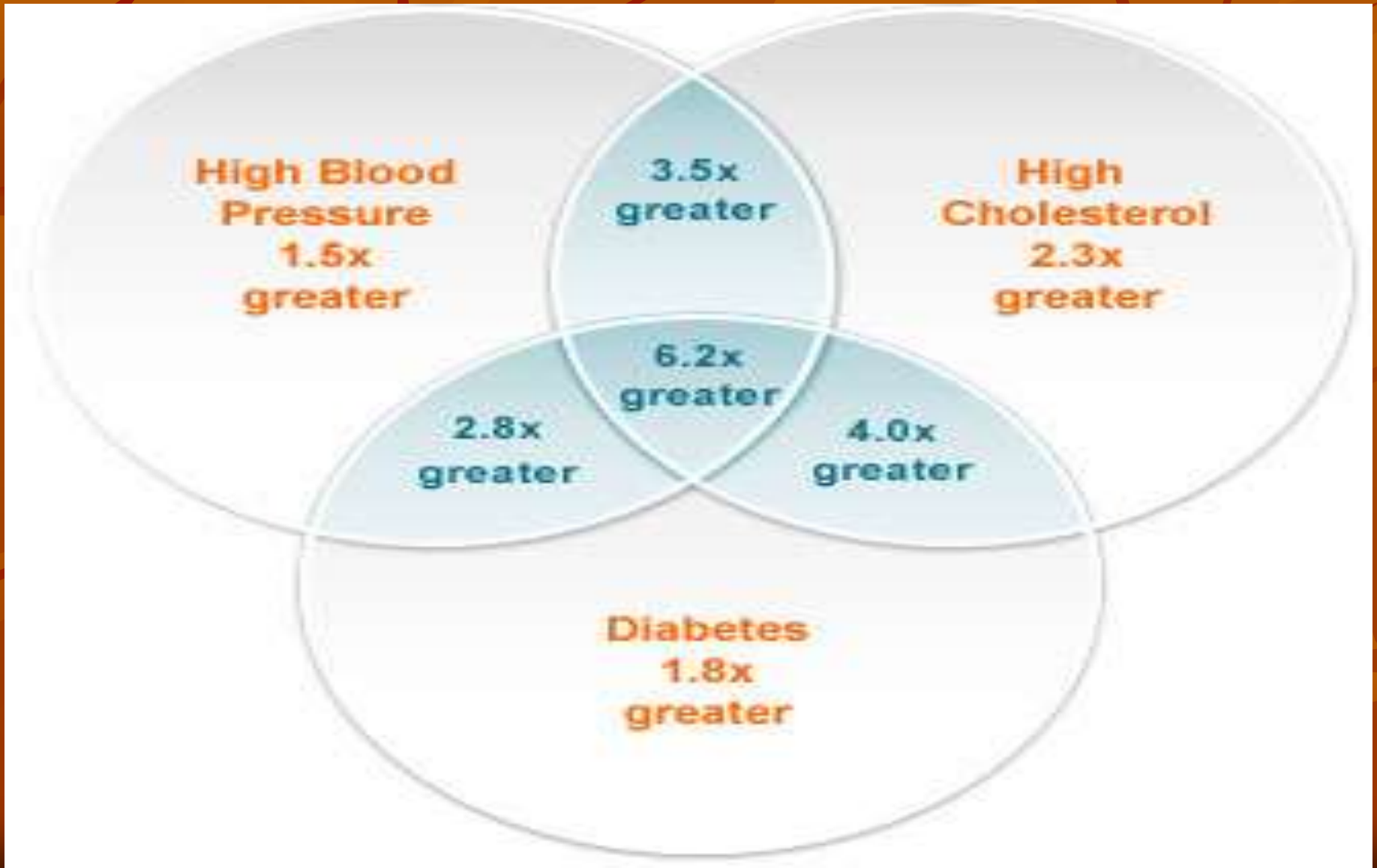
- **Nonmodifiable:**
  - **Age** – Occurrence doubles each decade >55 years
  - **Gender** – Equal for men & women; women die more frequently than men
  - **Race** – African Americans, Hispanics, Native Americans, Asian Americans -- higher incidence
  - **Heredity** – family history, prior transient ischemic attack, or prior stroke increases risk

Cerebrovascular Accident Risk Factors

Controllable Risks with Medical Treatment & Lifestyle Changes:

- High blood pressure
- Cigarette smoking
- High blood cholesterol
- Heart Disease
- Oral contraceptive use
- Sickle cell disease
- Hypercoagulability
- Diabetes
- TIA (Aspirin)
- Obesity
- Atrial fibrillation
- Physical inactivity
- Asymptomatic carotid stenosis

CVA – Risk Factors

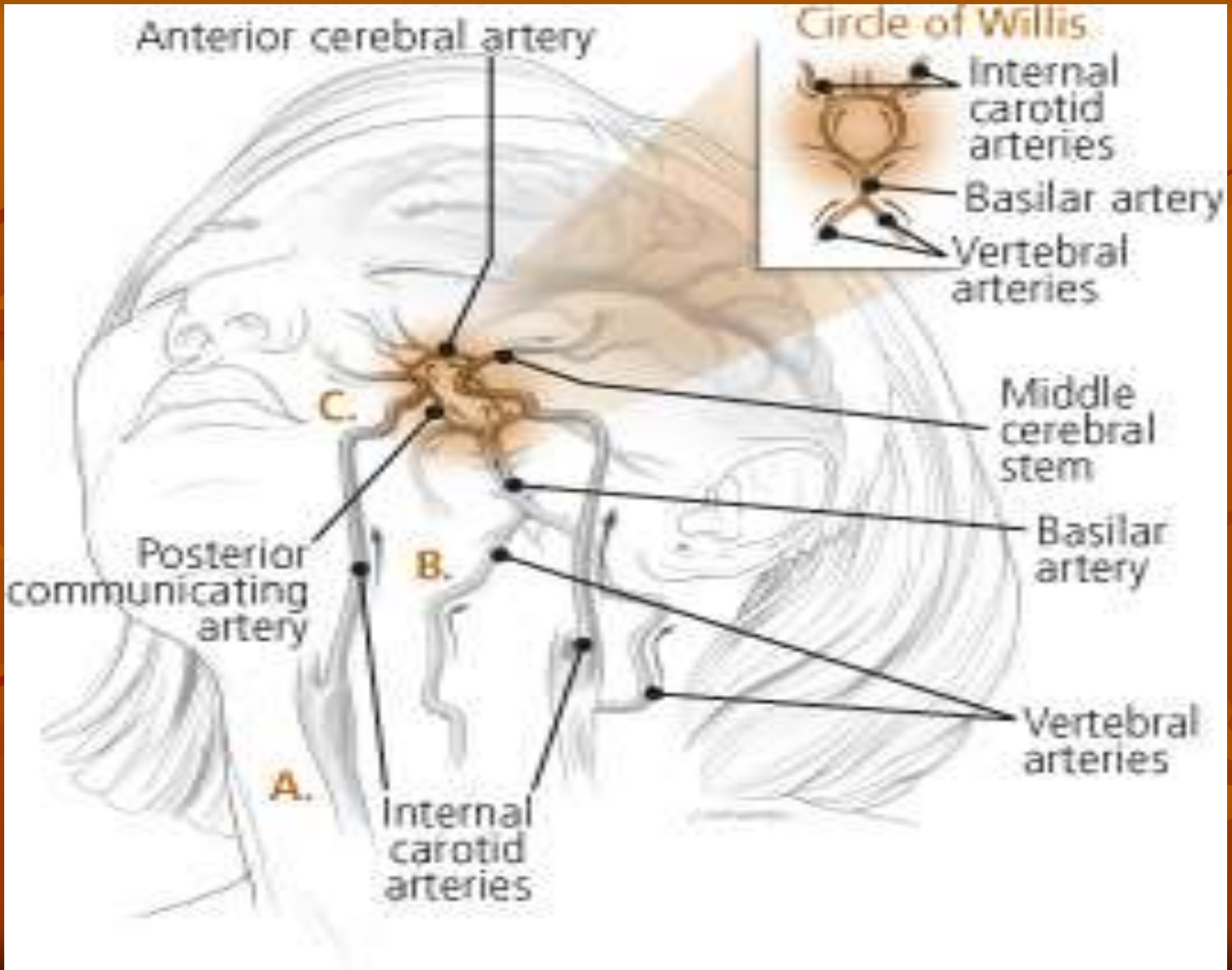


Cerebrovascular Accident
Anatomy of Cerebral Circulation

- **Blood Supply**
  - **Anterior: Carotid Arteries** – middle & anterior cerebral arteries
    - frontal, parietal, temporal lobes; basal ganglion; part of the diencephalon (thalamus & hypothalamus)
  - **Posterior: Vertebral Arteries** – basilar artery
    - Mid and lower temporary & occipital lobes, cerebellum, brainstem, & part of the diencephalon
  - **Circle of Willis** – connects the anterior & posterior cerebral circulation

Cerebrovascular Accident
Anatomy of Cerebral Circulation

- **Blood Supply**
  - **20% of cardiac output—750-1000ml/min**
    - >30 second interruption– neurologic metabolism is altered; metabolism stops in 2 minutes; brain cell death < 5 mins.


Anterior cerebral artery
Circle of Willis
Internal carotid arteries
Basilar artery
Vertebral arteries
C.
Middle cerebral stem
Basilar artery
Posterior communicating artery
B.
Vertebral arteries
A.
Internal carotid arteries

Cerebrovascular Accident Pathophysiology

- **Atherosclerosis**: major cause of CVA
  - **Thrombus formation & emboli development**
    - Abnormal filtration of lipids in the intimal layer of the arterial wall
    - Plaque develops & locations of increased turbulence of blood - bifurcations
    - Increased turbulence of blood or a tortuous area
    - Calcified plaques rupture or fissure
    - Platelets & fibrin adhere to the plaque
    - Narrowing or blockage of an artery by thrombus or emboli
    - **Cerebral Infarction: blocked artery with blood supply cut off beyond the blockage**

Cerebrovascular Accident Pathophysiology

- **Ischemic Cascade**
  - Series of metabolic events
    - Inadequate ATP adenosine triphosphate production
    - Loss of ion homeostasis
    - Release of excitatory amino acids – glutamate
    - Free radical formation
    - Cell death
  - **Border Zone**: reversible area that surrounds the core ischemic area in which there is reduced blood flow but which can be restored **(3 hours +/-)**

CVA? - Call 911

- Sudden numbness or weakness of face, arm, or leg, especially on one side of the body.
- Sudden confusion or trouble speaking or understanding speech.
- Sudden trouble seeing in one or both eyes.
- Sudden trouble walking, dizziness, or loss of balance or coordination
- Sudden severe headache with no known cause.

Cerebrovascular Accident
Transient Ischemic Attack

- Temporary focal loss of neurologic function
- Caused by ischemia of one of the vascular territories of the brain
  - Microemboli with temporary blockage of blood flow
- Lasts less than 24 hrs – often less than 15 mins
- Most resolve within 3 hours
- Warning sign of progressive cerebrovascular disease

Cerebrovascular Accident
Transient Ischemic Attack

- Diagnosis:
  - CT without contrast
    - Confirm that TIA is not related to brain lesions
  - Cardiac Evaluation
    - Rule out cardiac mural thrombi
- Treatment:
  - Medications that prevent platelet aggregation
    - ASA, Plavix
  - Oral anticoagulants

Cerebrovascular Accident Classifications

Based on underlying pathophysiologic findings

Cerebrovascular Accident Classifications

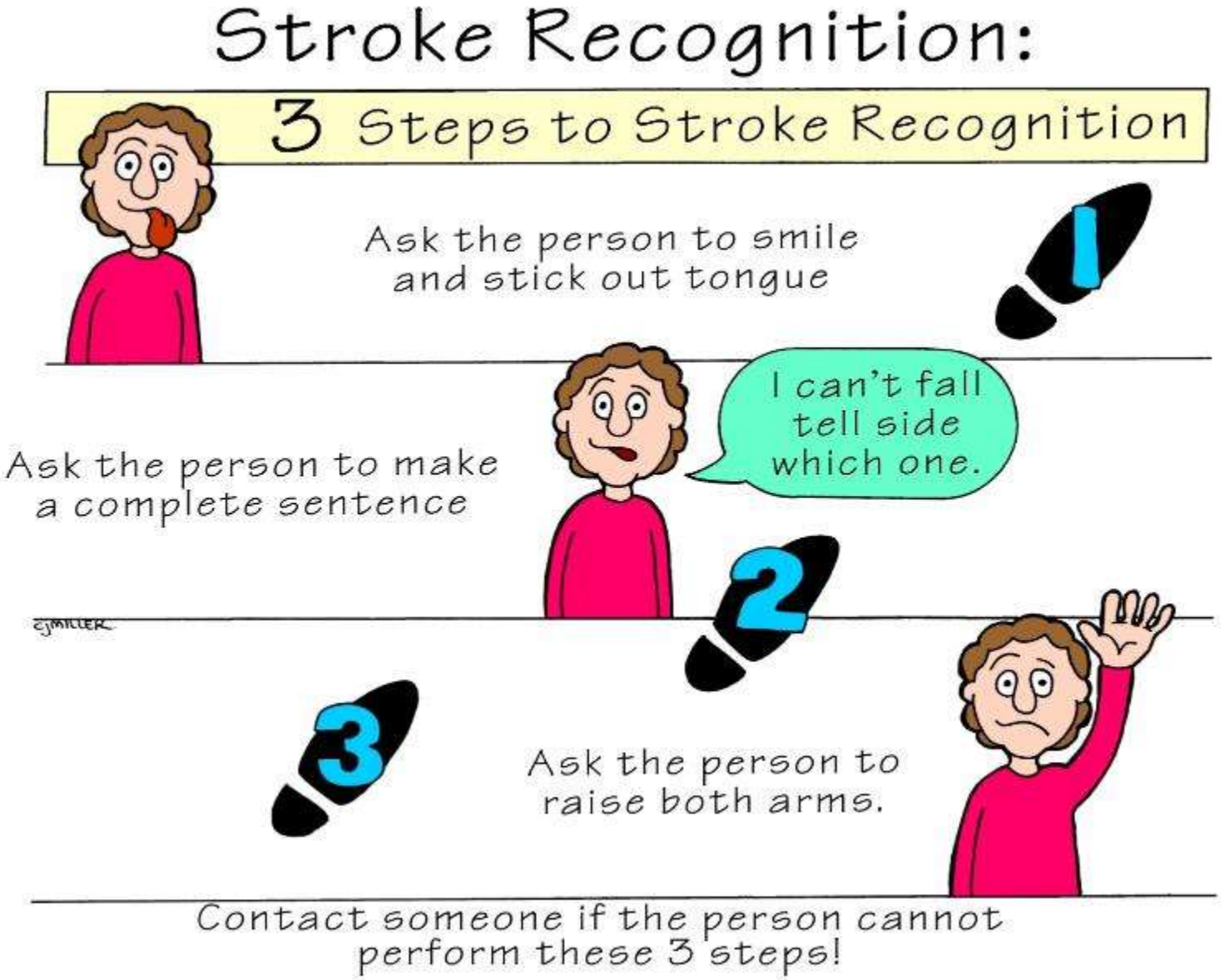
- Ischemic Stroke
  - Thrombotic
  - Embolic
- Hemorrhagic Stroke
  - Intracerebral Hemorrhage
  - Subarachnoid Hemorrhage
    - Aneurysm
      - Berry or Saccular

Cerebrovascular Accident Classifications

- **Ischemic Stroke—inadequate blood flow to the brain from partial or complete occlusions of an artery--85% of all strokes**
  - **Extent of a stroke depends on:**
    - **Rapidity of onset**
    - **Size of the lesion**
    - **Presence of collateral circulation**
  - Symptoms may progress in the first 72 hours as infarction & cerebral edema increase
- **Types of Ischemic Stroke:**

Thrombotic Stroke **Embolic Stroke**

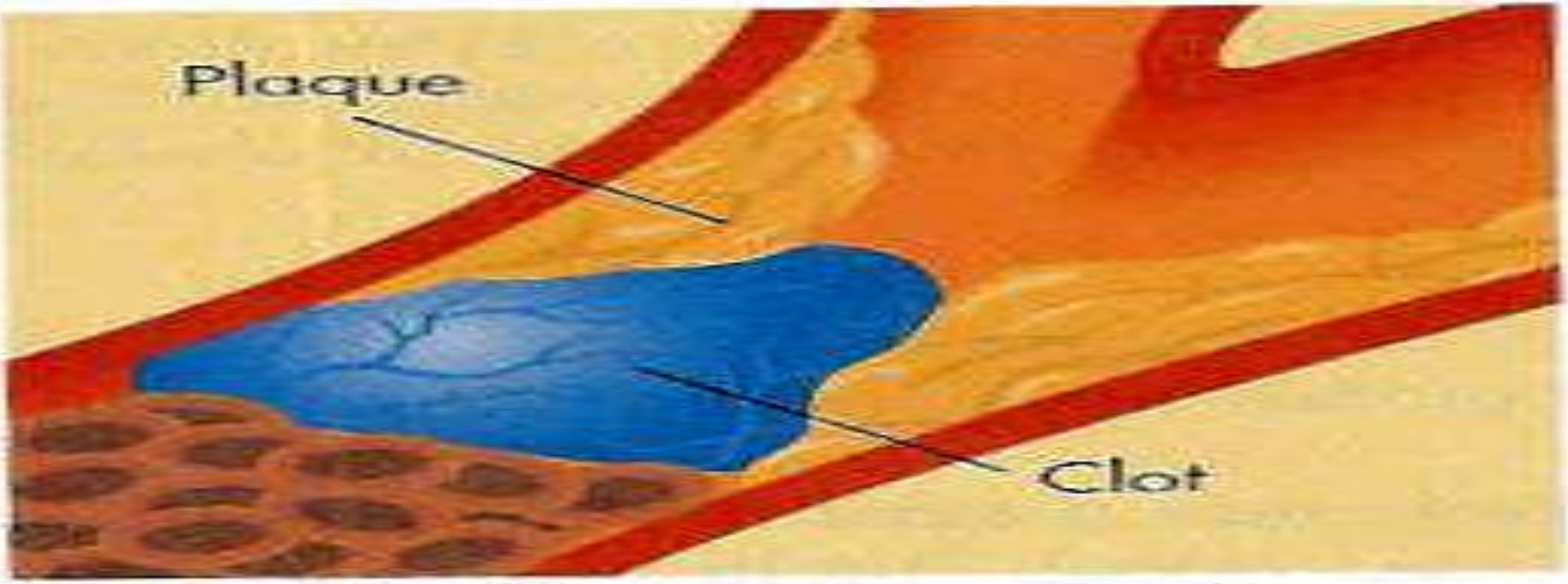
CVA Recognition



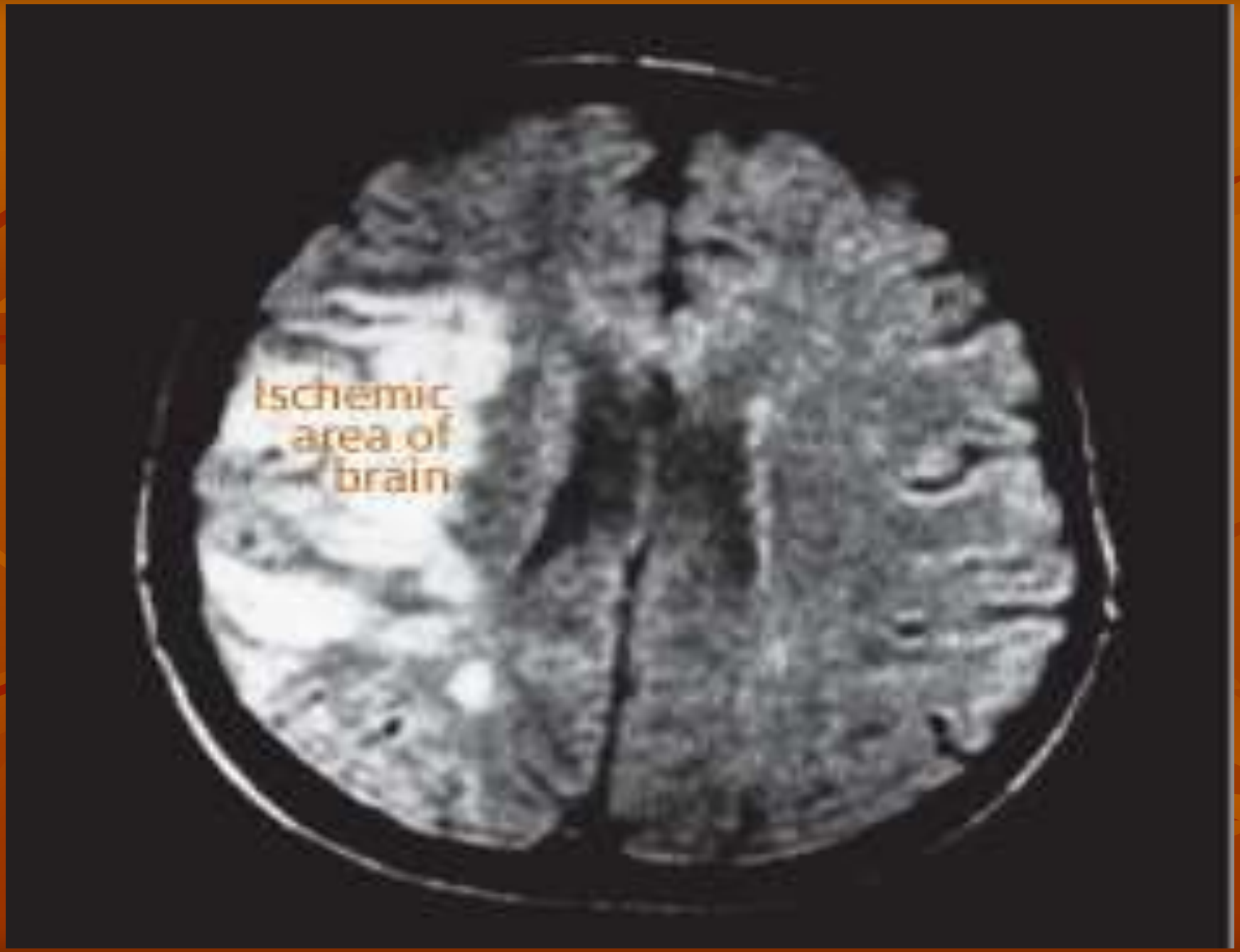
Cerebrovascular Accident
Ischemic – Thrombotic Stroke

- Lumen of the blood vessels narrow – then becomes occluded – infarction
- Associated with HTN and Diabetes Mellitus
  - >60% of strokes
  - 50% are preceded by TIA
  - Lacunar Stroke: development of cavity in place of infarcted brain tissue – results in considerable deficits – motor hemiplegia, contralateral loss of sensation or motor ability

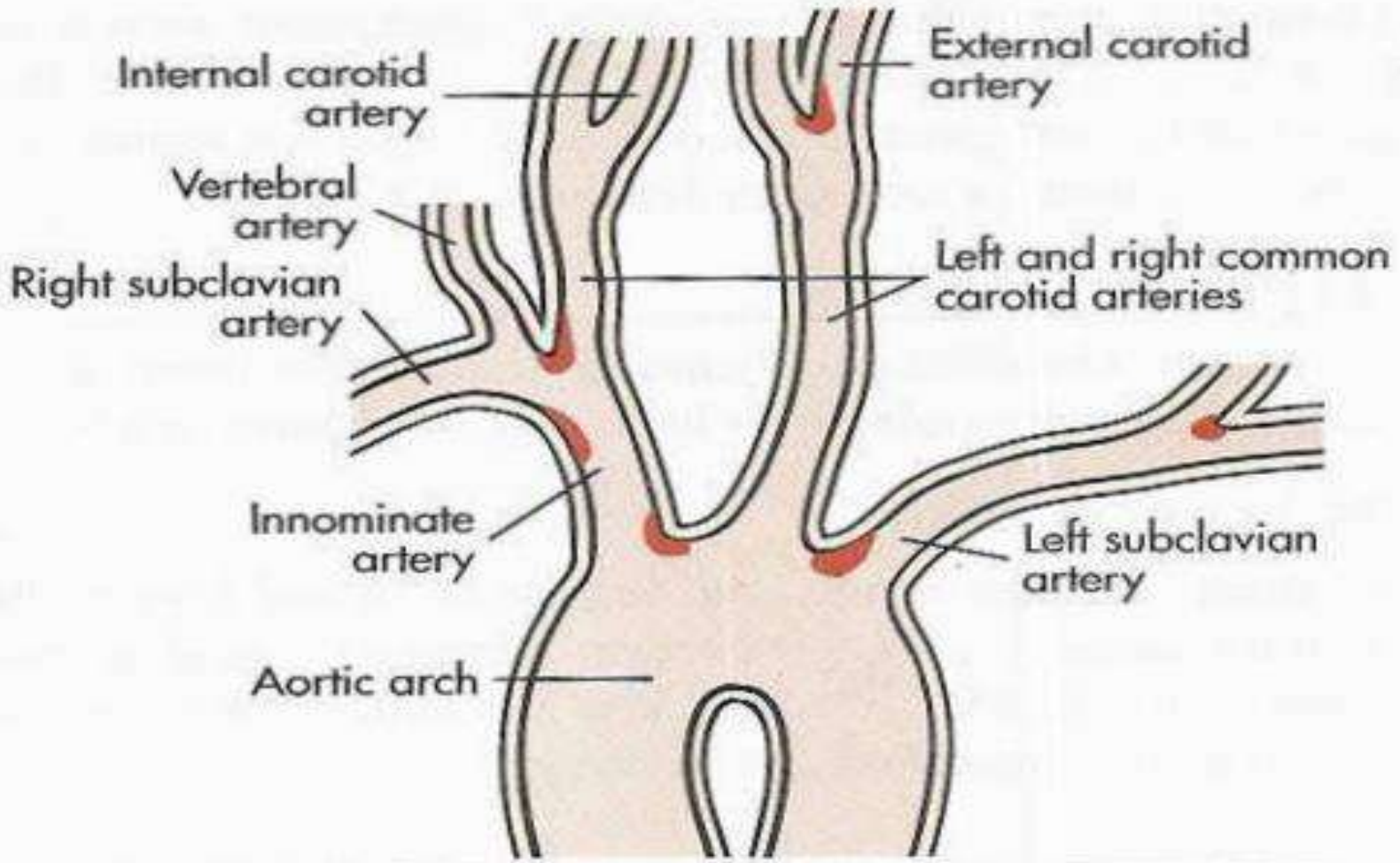
Cerebrovascular Accident
Thrombotic Stroke

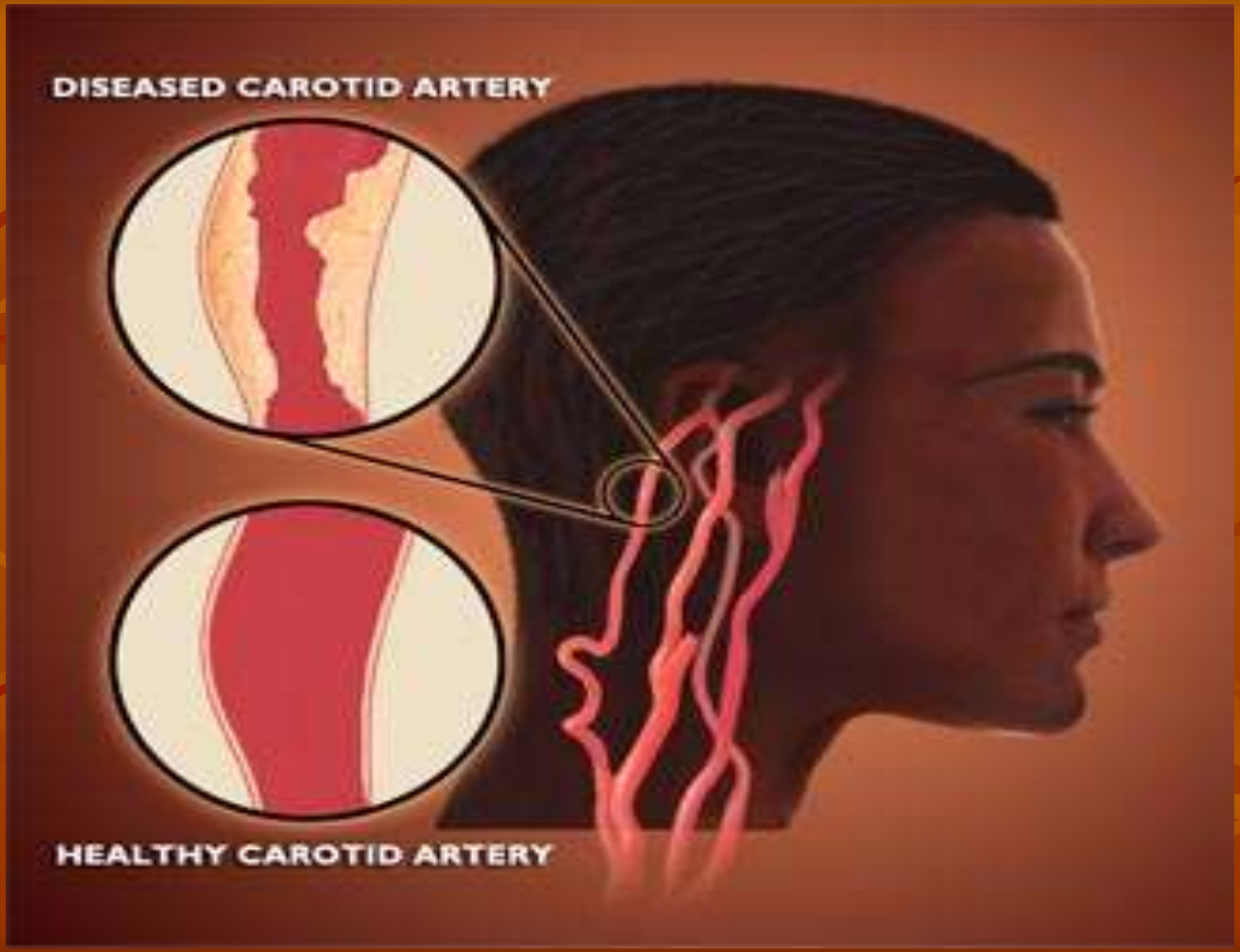


Thrombotic stroke. Cerebral thrombosis is a narrowing of the artery by fatty deposits called *plaque*. Plaque can cause a clot to form, which blocks the passage of blood through the artery.

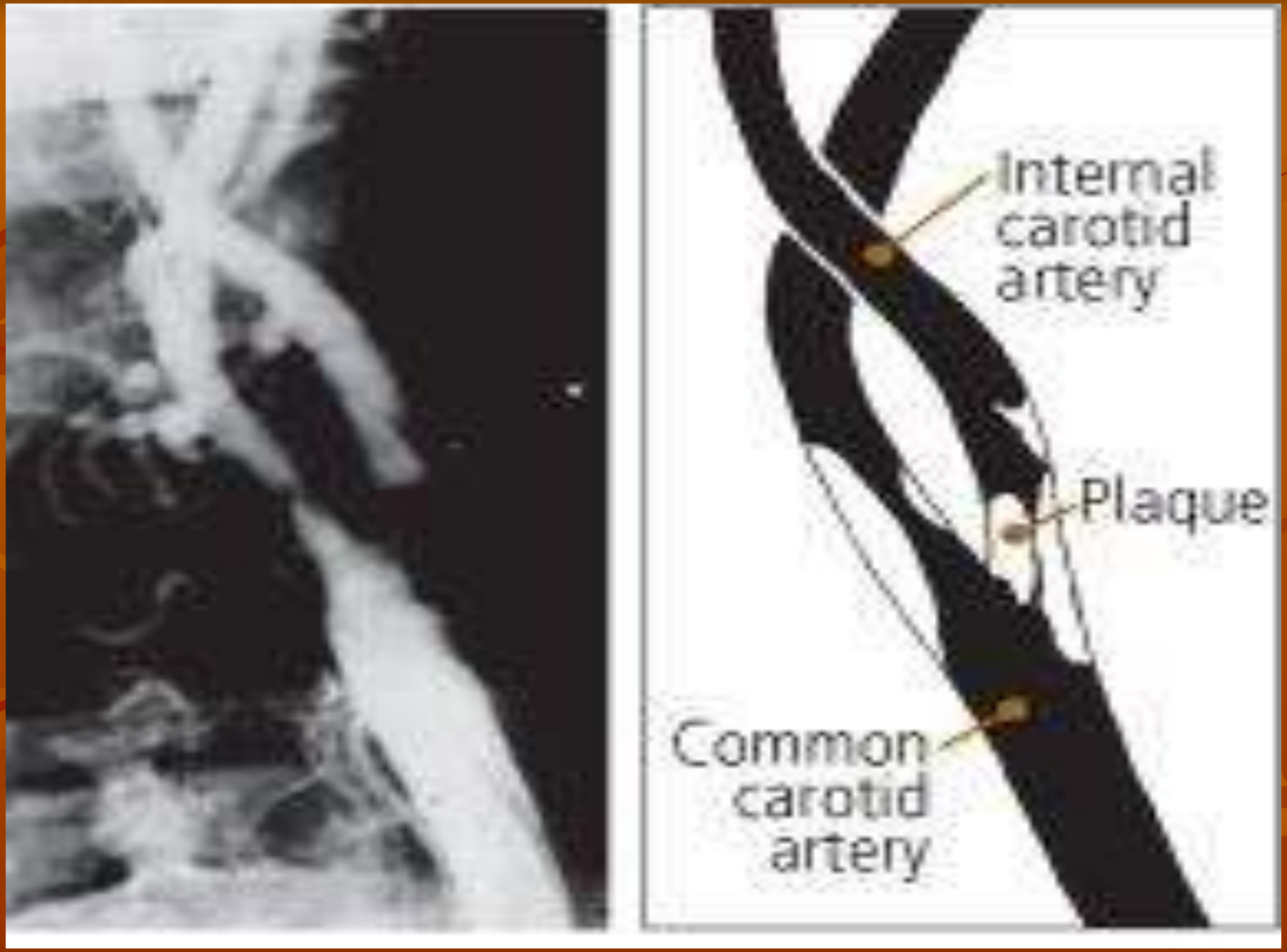

Ischemic
area of
brain

Cerebrovascular Accident
Common Sites of Atherosclerosis




DISEASED CAROTID ARTERY
HEALTHY CAROTID ARTERY


CURVED
REFORMATION


Internal carotid artery
Plaque
Common carotid artery

Cerebrovascular Accident
Ischemic – Embolic Stroke

- Embolus lodges in and occludes a cerebral artery
- Results in infarction & cerebral edema of the area supplied by the vessel
- Second most common cause of stroke – 24%
- Emboli originate in endocardial layer of the heart – atrial fibrillation, MI, infective endocarditis, rheumatic heart disease, valvular prostheses
- Rapid occurrence with severe symptoms – body does not have time to develop collateral circulation
- Any age group
- Recurrence common if underlying cause not treated

Cerebrovascular Accident
Embolic Stroke

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.

Cerebrovascular Accident Goals for Management

- Immediate – assess & stabilize
  - ABCs, VS
  - Neurologic screening
  - Oxygen if hypoxic
  - IV access
  - Check glucose
  - Activate stroke team – **CODE GREEN**
  - 12-lead EKG
- Immediate Neuro Assessment
  - Establish symptom onset
  - Review hx
  - Stroke Scale
  - Facial droop; arm drift; abnormal speech

Cerebrovascular Accident Goals for Management

- **CT Scan – No hemorrhage:**
  - Consider Fibrinolytic therapy
    - Check for exclusions
    - tPA
      - No anticoagulants or antiplatelet therapy for 24 hours
  - If not a candidate: Antiplatelet Therapy
- **CT Scan – Hemorrhage:**
  - Neurosurgery?
  - If no surgery: Stroke Unit
    - Monitor BP and treat Hypertension
    - Monitor Neuro status
    - Monitor blood glucose and treat as needed
    - Supportive therapy

Cerebrovascular Accident Goals for Management

- Immediate – assess & stabilize
  - ABCs, VS
  - Neurologic screening
  - Oxygen if hypoxic
  - IV access
  - Check glucose
  - Active stroke team
  - Emergent CT scan of brain
  - 12-lead EKG
- Immediate Neuro Assessment
    - Establish symptom onset
  - Review hx
  - Stroke Scale
  - Facial droop; arm drift; abnormal speech

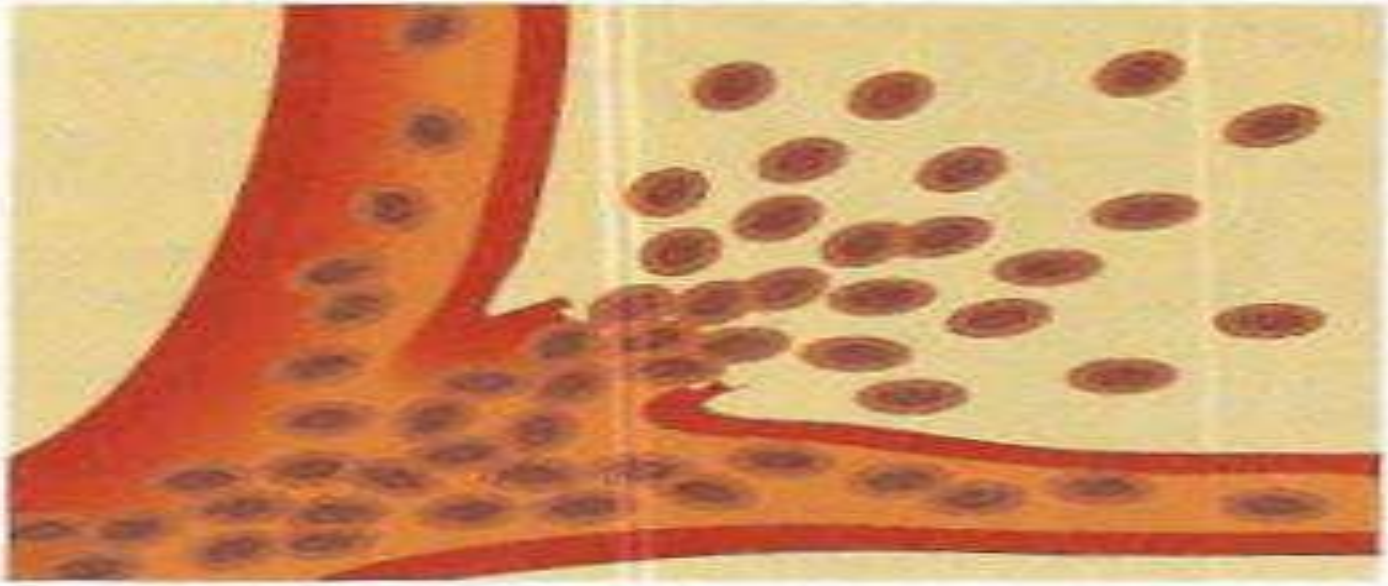
Cerebrovascular Accident
Hemorrhagic Stroke

- **Hemorrhagic Stroke**
  - 15% of all strokes
  - Result from bleeding into the brain tissue itself
    - Intracerebral
    - Subarachnoid

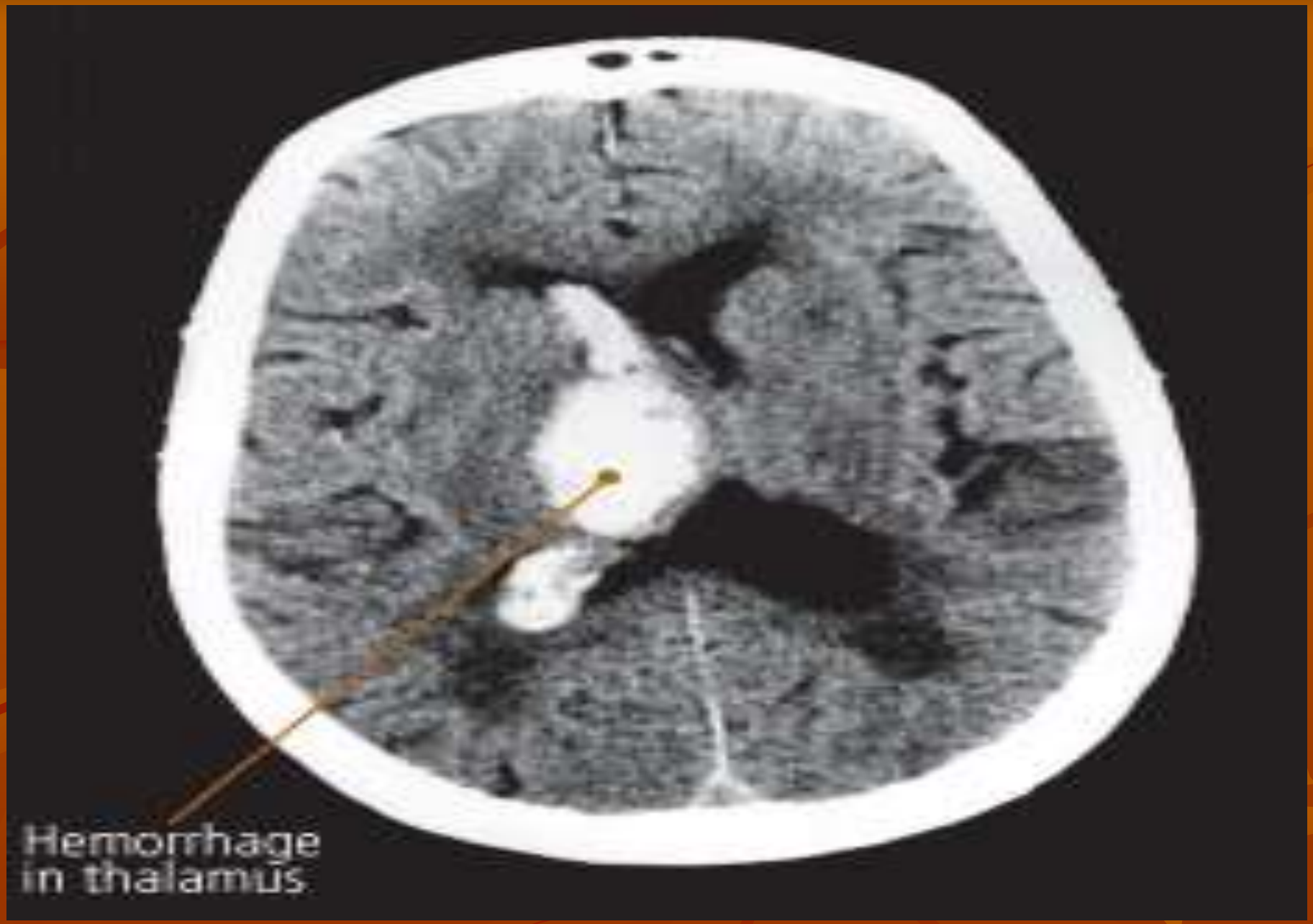
Cerebrovascular Accident
Hemorrhage Stroke
Intracerebral Hemorrhage

- Rupture of a vessel
- Hypertension – most important cause
- Others: vascular malformations, coagulation disorders, anticoagulation, trauma, brain tumor, ruptured aneurysms
- Sudden onset of symptoms with progression
- Neurological deficits, headache, nausea, vomiting, decreased LOC, and hypertension
- Prognosis: poor – 50% die within weeks
- 20% functionally independent at 6 months

Cerebrovascular Accident
Hemorrhage Stroke
Intracerebral Hemorrhage



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


Hemorrhage
in thalamus

Cerebrovascular Accident
Hemorrhagic-Subarachnoid

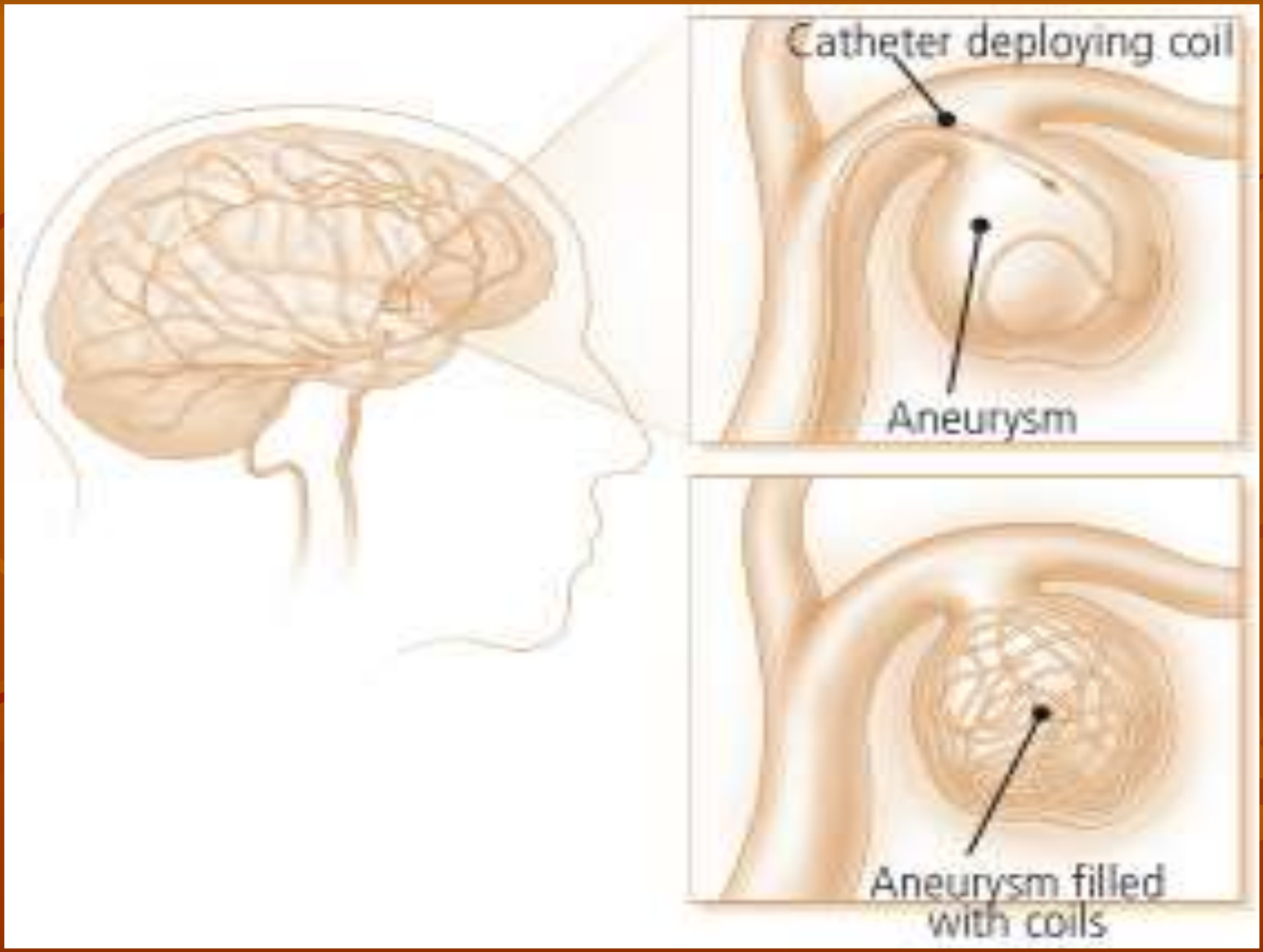
- **Hemorrhagic Stroke–Subarachnoid Hemorrhage**
  - **Intracranial bleeding into the cerebrospinal fluid-filled space between the arachnoid and pia mater membranes on the surface of the brain**

Cerebrovascular Accident
Hemorrhagic-Subarachnoid

- Commonly caused by rupture of cerebral aneurysm (congenital or acquired)
  - Saccular or berry – few to 20-30 mm in size
  - Majority occur in the Circle of Willis
- Other causes: Arteriovenous malformation (AVM), trauma, illicit drug abuse
- Incidence: 6-16/100,000
- Increases with age and more common in women

Cerebrovascular Accident
Hemorrhagic-Subarachnoid
Cerebral Aneurysm

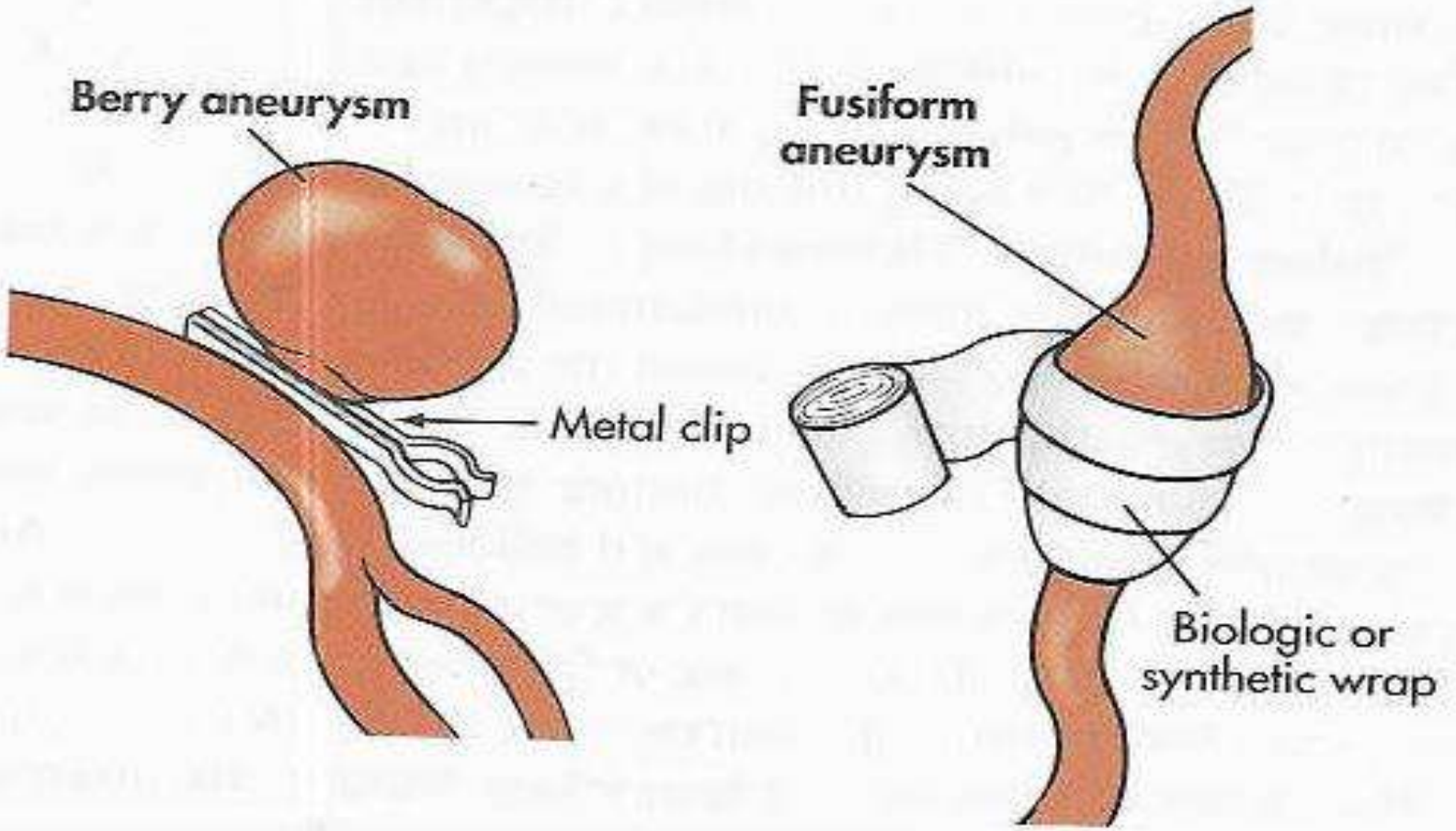
- Warning Symptoms: sudden onset of a severe headache – "worst headache of one's life"
- Change of LOC, Neurological deficits, nausea, vomiting, seizures, stiff neck
- Despite improvements in surgical techniques, many patients die or left with significant cognitive difficulties


Catheter deploying coil
Aneurysm
Aneurysm filled with coils

Hemorrhagic-Subarachnoid Cerebral Aneurysm

- **Surgical Treatment:**
  - **Clipping the aneurysm – prevents rebleed**
  - **Coiling – platinum coil inserted into the lumen of the aneurysm to occlude the sac**
  - **Postop: Vasospasm prevention – Calcium Channel Blockers**

Hemorrhagic-Subarachnoid Cerebral Aneurysm – Surgical Tx



Hemorrhagic-Subarachnoid Cerebral Aneurysm – Coiling

Cerebrovascular Accident Classification

TYPE	GENDER/AGE	WARNING	TIME OF ONSET	COURSE/PROGNOSIS
Ischemic				
Thrombotic	Men more than women, oldest median age	TIA (30%-50% of cases)	During or after sleep	Stepwise progression, signs and symptoms develop slowly, usually some improvement, recurrence in 20%-25% of survivors
Embolic	Men more than women	TIA (uncommon)	Lack of relationship to activity, sudden onset	Single event, signs and symptoms develop quickly, usually some improvement, recurrence common without aggressive treatment of underlying disease
Hemorrhagic				
Intracerebral	Slightly higher in women	Headache (25% of cases)	Activity (often)	Progression over 24 hr; poor prognosis, fatality more likely with presence of coma
Subarachnoid	Slightly higher in women, youngest median age	Headache (common)	Activity (often), sudden onset Most commonly related to head trauma	Single sudden event usually, fatality more likely with presence of coma

TIA, Transient ischemic attack.

Cerebrovascular Accident
Clinical Manifestations
Middle Cerebral Artery Involvement

- Contralateral weakness
  - Hemiparesis; hemiplegia
- Contralateral hemianesthesia
- Loss of proprioception, fine touch and localization
- Dominant hemisphere: aphasia
- Nondominant hemisphere – neglect of opposite side; anosognosia – unaware or denial of neuro deficit
- Homonymous hemianopsia – defective vision or blindness right or left halves of visual fields of both eyes

Cerebrovascular Accident
Clinical Manifestations
Anterior Cerebral Artery Involvement

- Brain stem occlusion
- Contralateral
  - weakness of proximal upper extremity
  - sensory & motor deficits of lower extremities
- Urinary incontinence
- Sensory loss (discrimination, proprioception)
- Contralateral grasp & sucking reflexes may be present
- Apraxia – loss of ability to carry out familiar purposeful movements in the absence of sensory or motor impairment
- Personality change: flat affect, loss of spontaneity, loss of interest in surroundings
- Cognitive impairment

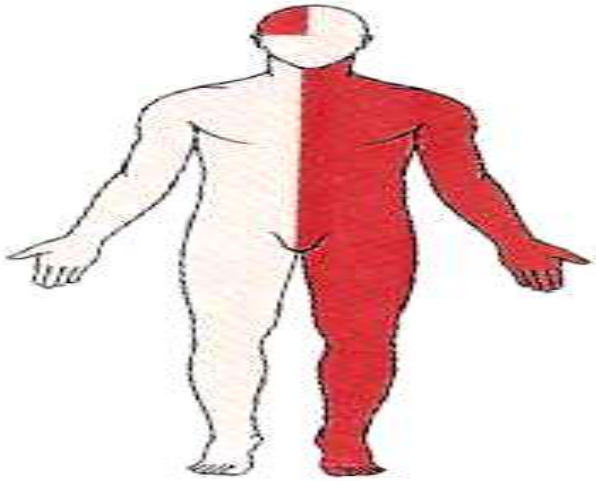
Cerebrovascular Accident
Clinical Manifestations
Posterior Cerebral Artery & Vertebrobasilar Involvement

- Alert to comatose
- Unilateral or bilateral sensory loss
- Contralateral or bilateral weakness
- Dysarthria – impaired speech articulation
- Dysphagia – difficulty in swallowing
- Hoarseness
- Ataxia, Vertigo
- Unilateral hearing loss
- Visual disturbances (blindness, homonymous hemianopsia, nystagmus, diplopia)

Cerebrovascular Accident Clinical Manifestations

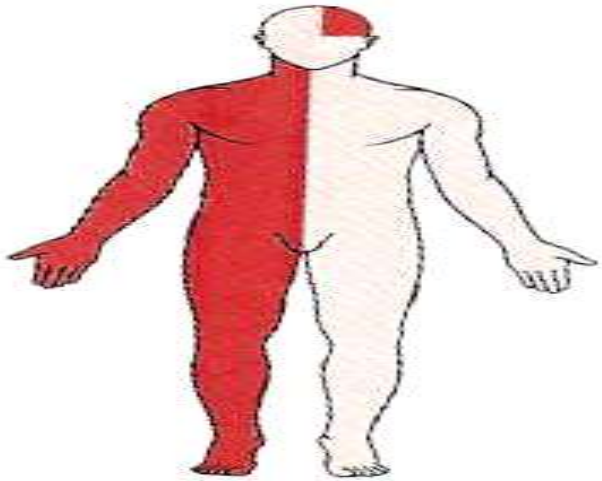
- **Motor Function Impairment**
- Caused by destruction of motor neurons in the pyramidal pathway (brain to spinal cord)
  - **Mobility**
  - **Respiratory function**
  - **Swallowing and speech**
  - **Gag reflex**
  - **Self-care activities**

Cerebrovascular Accident
Clinical Manifestations
Right Brain – Left Brain Damage



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

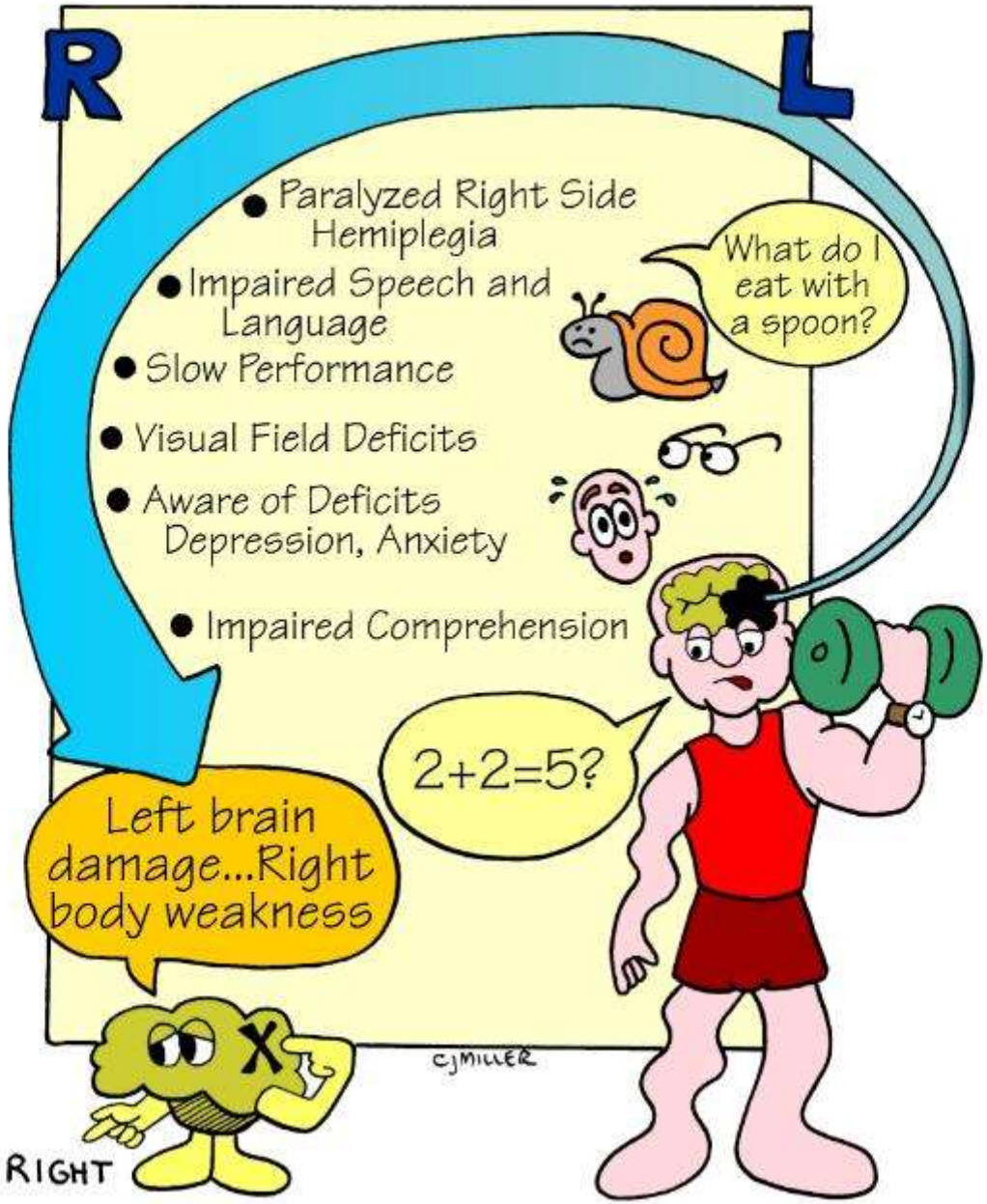
- Paralyzed left side: hemiplegia
- Left-sided neglect
- Spatial-perceptual deficits
- Tends to deny or minimize problems
- Rapid performance, short attention span
- Impulsive, safety problems
- Impaired judgment
- Impaired time concepts



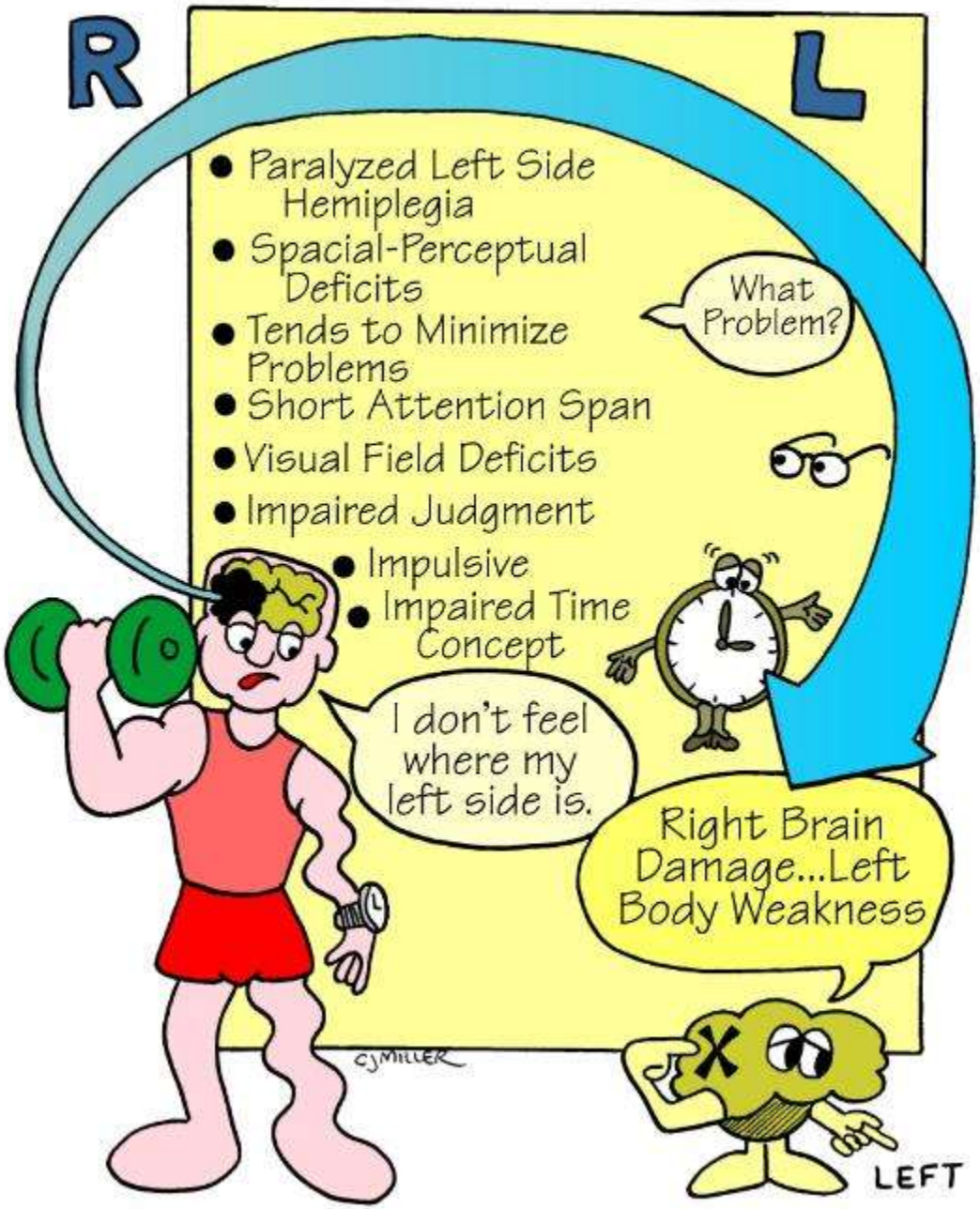
Left-brain damage
(stroke on left side of the brain)

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

LEFT CVA



RIGHT CVA



Cerebrovascular Accident Clinical Manifestations

- **Affect**
  - Difficulty controlling emotions
  - Exaggerated or unpredictable emotional response
  - Depression / feelings regarding changed body image and loss of function

Cerebrovascular Accident Clinical Manifestations

- **Intellectual Function**
  - Memory and judgment
    - Left-brain stroke: cautious in making judgments
    - Right-brain stroke: impulsive & moves quickly to decisions
  - Difficulties in learning new skills

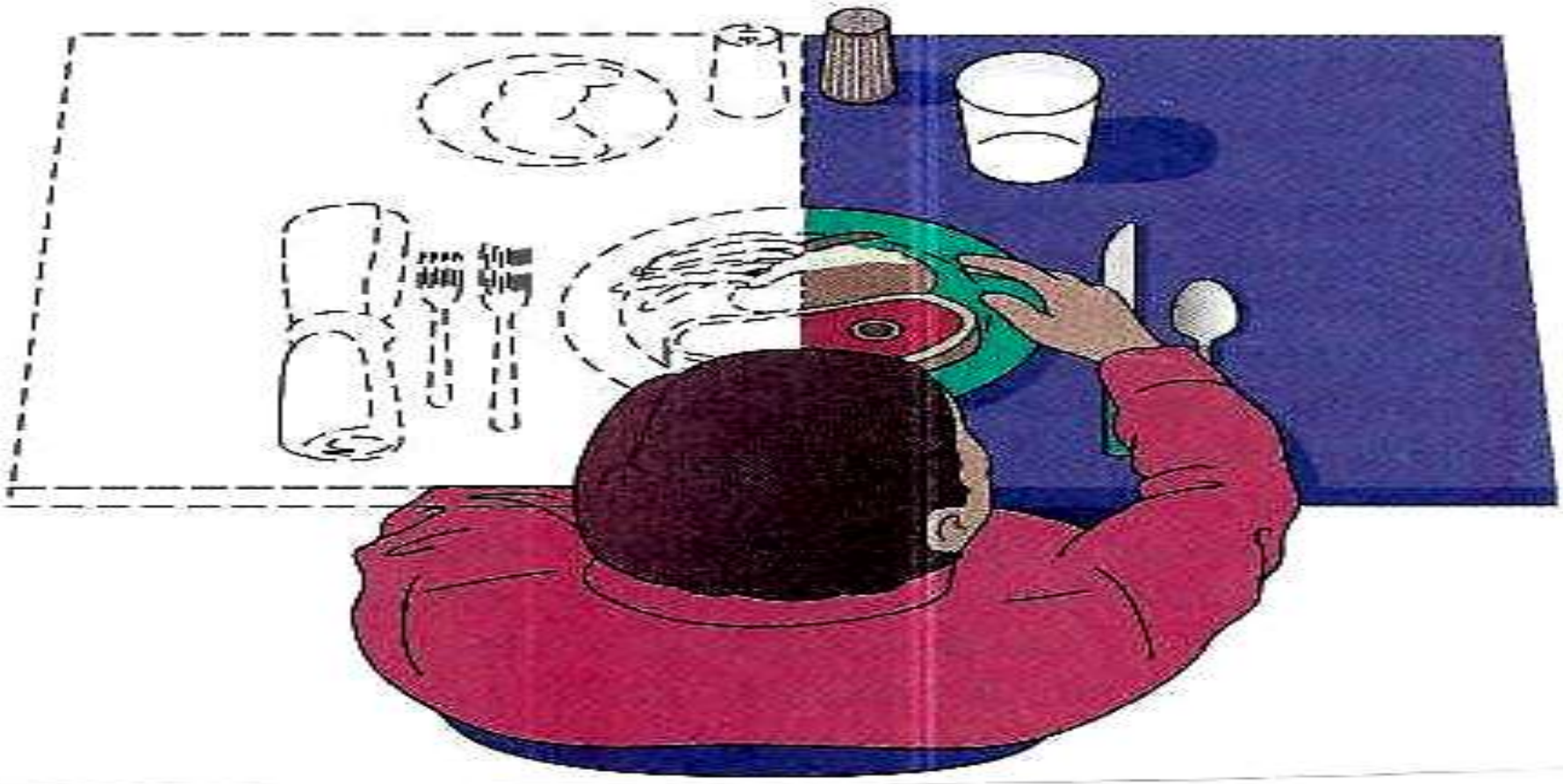
Cerebrovascular Accident Clinical Manifestations

- **Communication**
- Left hemisphere dominant for language skills in the right-handed person & most left-handed persons -- Aphasia/Dysphasia
- Involvement Expression & Comprehension
  - **Receptive Aphasia (Wernicke's area):** sounds of speech nor its meaning can be understood – spoken & written
  - **Expressive Aphasia (Broca's area):** difficulty in speaking and writing
  - **Dysarthria:** Affects the mechanics of speech due to muscle control disturbances – pronunciation, articulation, and phonation

Cerebrovascular Accident Clinical Manifestations

- Spatial-Perceptual Alterations – 4 categories:
  - 1. Incorrect perception of self & illness
  - 2. Erroneous perception of self in space – may neglect all input from the affected side (worsened by homonymous hemianopsia)
  - 3. Agnosia: Inability to recognize an object by sight, touch or hearing
  - 4. Apraxia: Inability to carry out learned sequential movements on command

Homonymous Hemianopsia



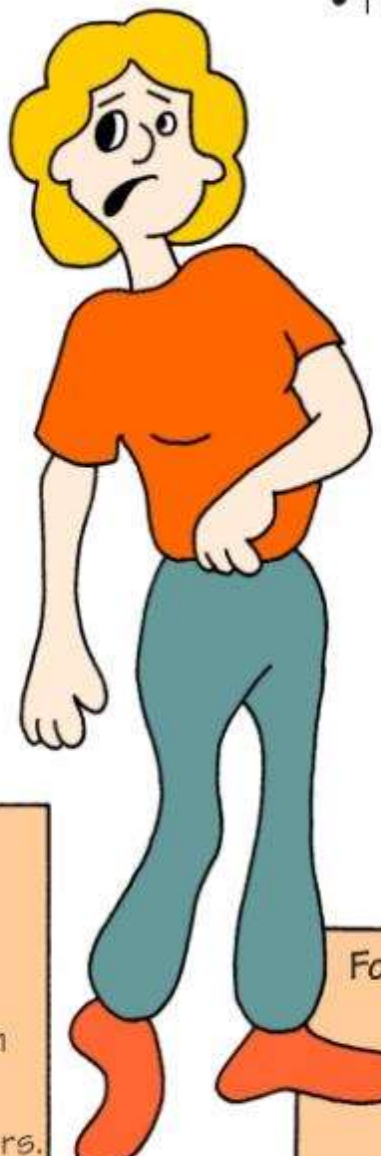
Cerebrovascular Accident Clinical Manifestations

- **Elimination**
  - Most problems occur initially and are temporary
  - One hemisphere stroke: prognosis is excellent for normal bladder function
  - Bowel elimination: motor control not a problem – constipation associated with immobility, weak abdominal muscles, dehydration, diminished response to the defecation reflex

Stroke

BRAIN ACCIDENT - CVA

- Headache
- Mental Changes
  - Confusion
  - Disorientation
  - Memory Impairment
- Aphasia (CVA Left Hemisphere)
- Resp Problems (↓Neuromuscular Control)
- ↓Cough / Swallow Reflex
- Agnosia (↓Sensory Interpretation)
- Incontinence
- Seizures



- Hemiparesis or Hemiplegia
- Emotional Lability
- Visual Changes (Homonymous Hemianopsia)

- Horner's Syndrome - Ptosis of Upper Lid
- Vomiting
- Perceptual Defects (CVA Right Hemisphere)
- Hypertension
- Apraxia (↓Learned Movements)

TIA:

- Confusion
- Vertigo
- Dysarthria
- Transient Hemiparesis
- Temporary Vision Changes
- Lasts a Few Minutes→24 hrs.

Focal Neurological S & S:

- Paralysis
- Sensory Loss
- Language Disorder
- Reflex Changes

Cerebrovascular Accident Treatment Goals

- **Prevention – Health Maintenance Focus:**
  - Healthy diet
  - Weight control
  - Regular exercise
  - No smoking
  - Limit alcohol consumption
  - Route health assessment
  - Control of risk factors

Cerebrovascular Accident Treatment Goals

- Prevention
- Drug Therapy
- Surgical Therapy
- Rehabilitation

Cerebrovascular Accident Diagnostic Studies

- Done to confirm CVA and identify cause
  - PE: Neuro Assessment; Carotid bruit
  - Carotid doppler studies (ultrasound study)
  - CT – primary – identifies size, location, differentiates between ischemic and hemorrhagic
  - CTA – CT Angiography – visualizes vasculature
  - MRI – greater specificity than CT
    - May not be able to be used on all patients (metal, claustrophobia)
  - Angiography: gold standard for imaging carotid arteries

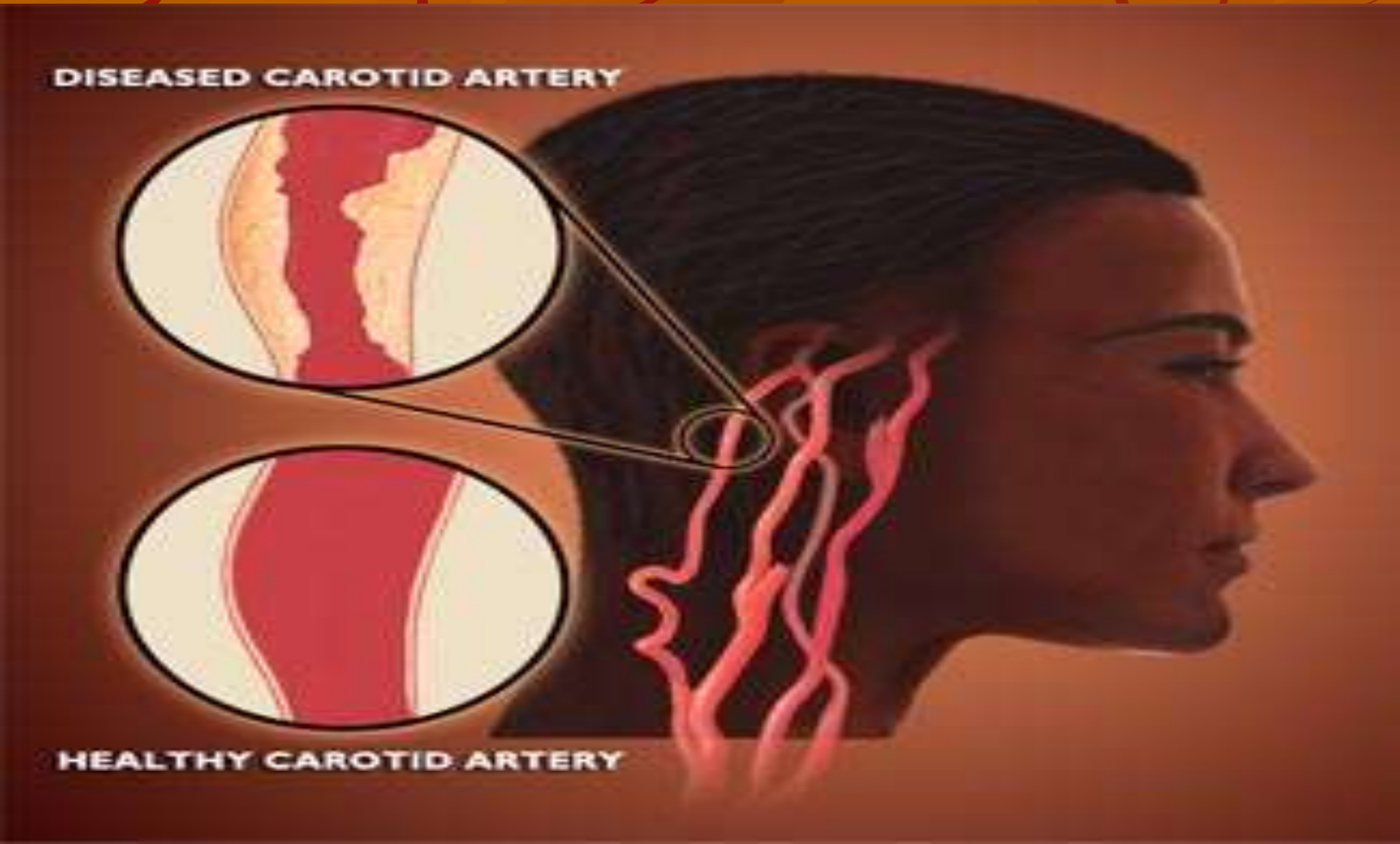
Cerebrovascular Accident Treatment Goals

- **Drug Therapy – Thrombotic CVA – to reestablish blood flow through a blocked artery**
- **Thrombolytic Drugs**: tPA (tissue plasminogen activator)
  - produce localized fibrinolysis by binding to the fibrin in the thrombi
  - Plasminogen is converted to plasmin (fibrinolysin)
  - Enzymatic action digests fibrin & fibrinogen
  - Results is clot lysis
- **Administered within 3 hours of symptoms of ischemic CVA**
  - Confirmed DX with CT
  - Patient anticoagulated
- ASA, Calcium Channel Blockers

CVA - Treatment Goals

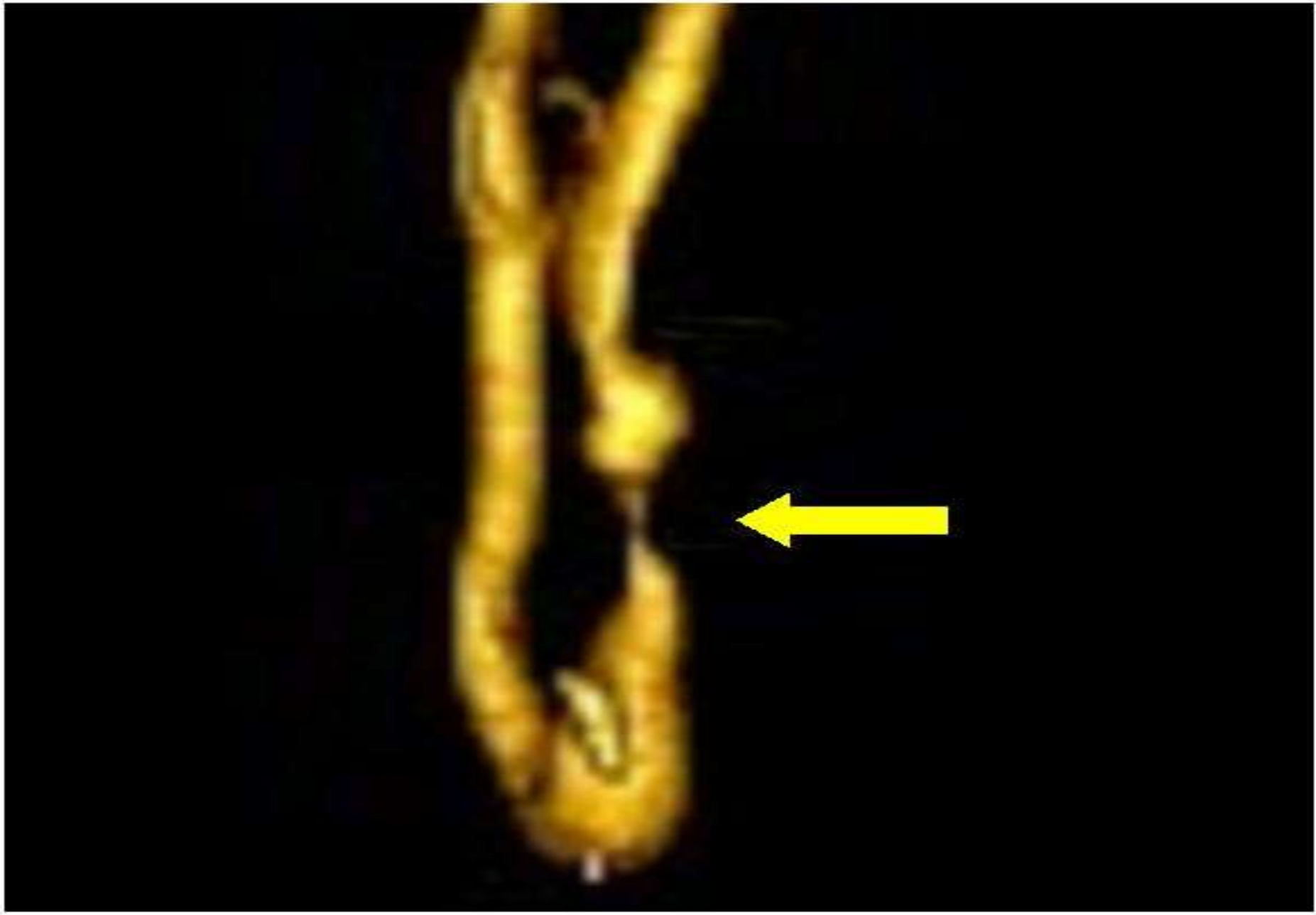
- **Surgical Treatment**
  - **Carotid endarterectomy** – preventive – > 100,000/year
    - removal of atheromatous lesions
  - **Clipping, wrapping, coiling Aneurysm**
  - **Evacuation of aneurysm-induced hematomas larger than 3 cm.**
  - **Treatment of AV Malformations**

Carotid Artery Disease



Carotid Artery Disease

- **Carotid artery disease is the leading cause of strokes.**
- **More than** 50% of stroke victims present no warning signs.
-
- After age 55, the risk of stroke doubles every 10 years.
- **97% of the adult population cannot name a single warning sign of a stroke.**
- **50% of nursing home admissions are stroke victims**



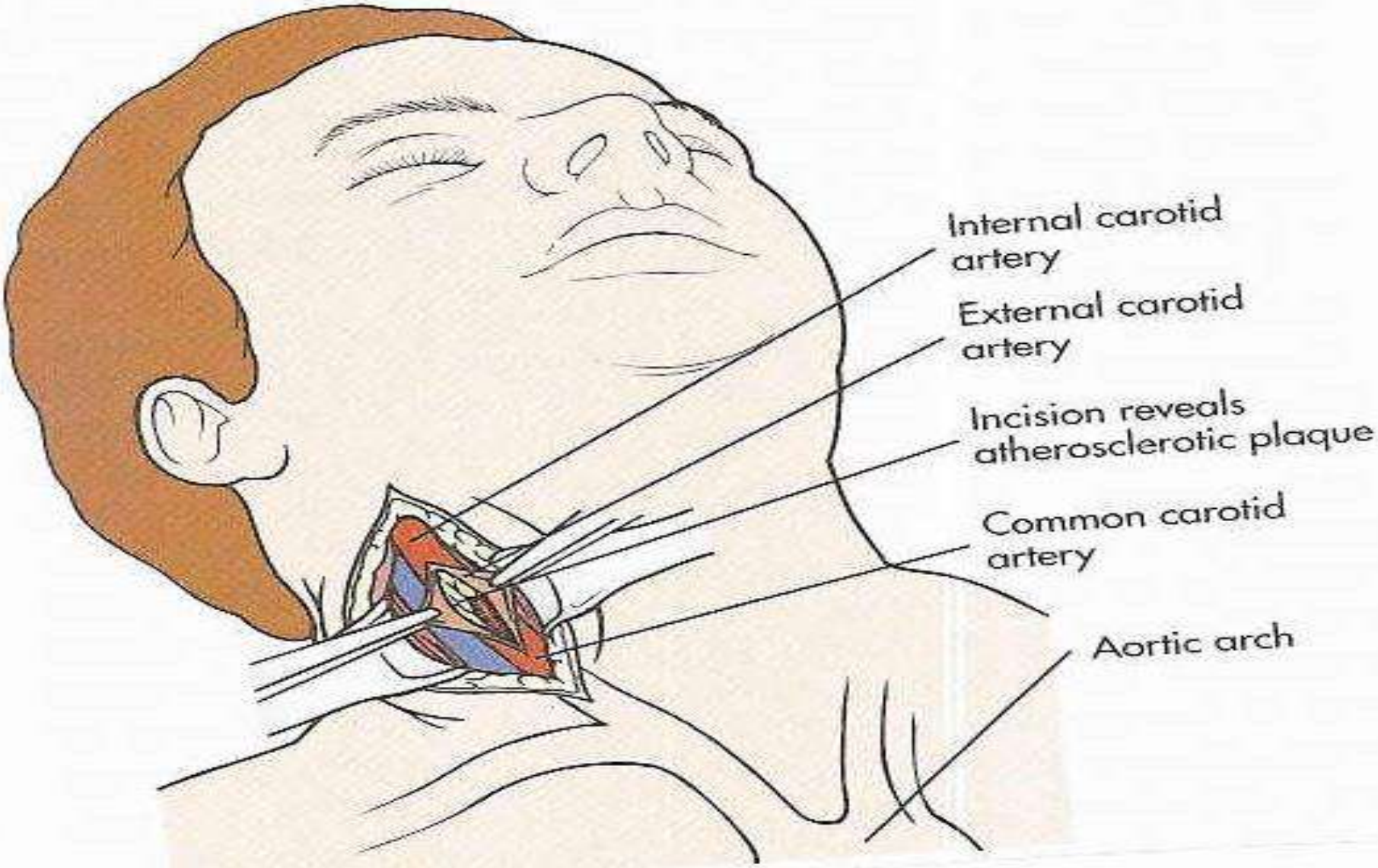
Carotid Stenosis

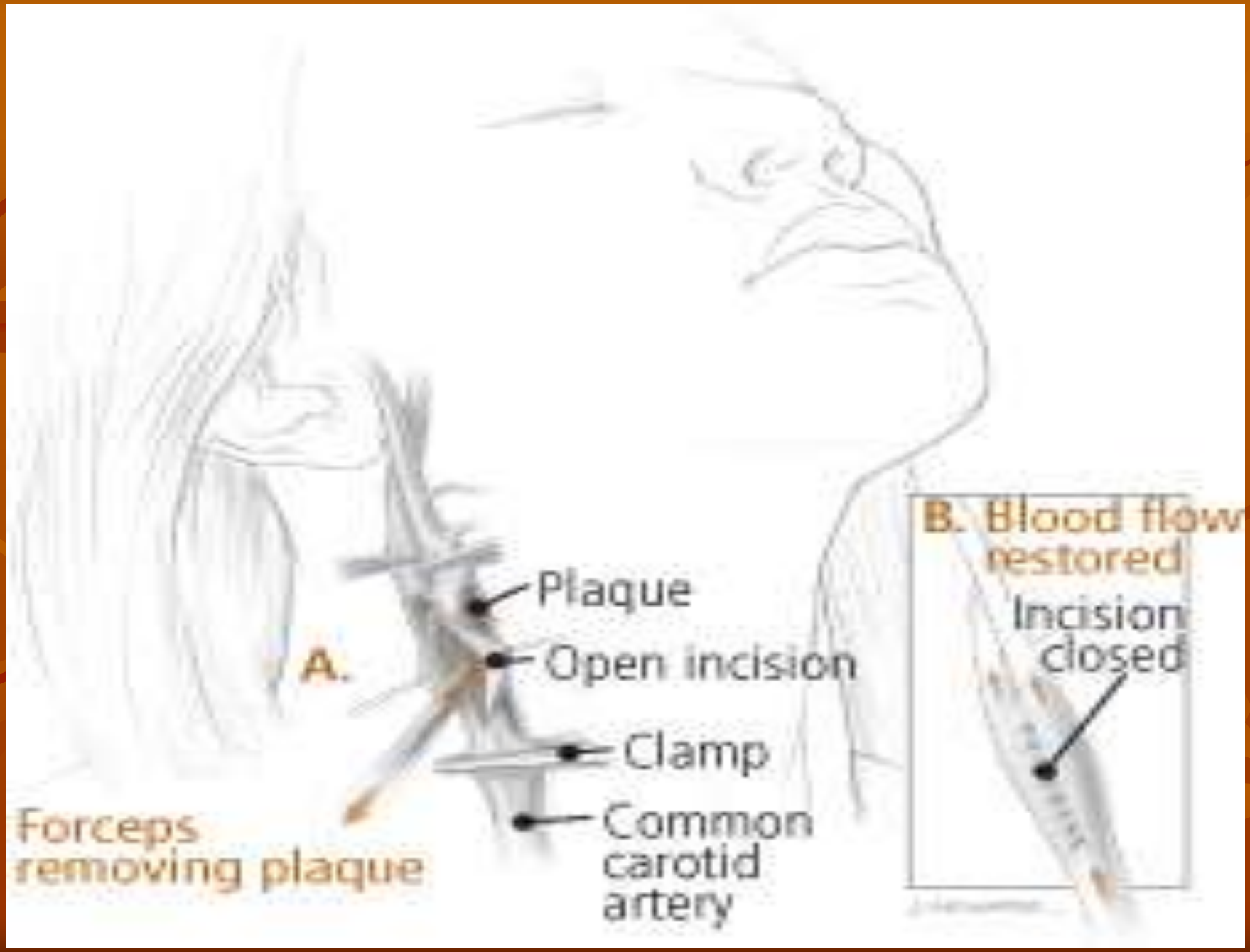
Treatment of Narrowing of the Arteries Supplying Blood to the Brain

Pre-Treatment:
Narrowed Artery

Post-Treatment:
Stent Place → Open Artery

Carotid Endarterectomy




A.
Plaque
Open incision
Clamp
Common carotid artery
Forceps removing plaque
B. Blood flow restored
Incision closed

Cerebrovascular Accident Treatment Goals

- **Drug Therapy**
  - Measures to prevent the development of a thrombus or embolus for "At Risk" patients:
    - **Antiplatelet Agents**
      - Aspirin
      - Plavix
      - Combination
    - **Oral anticoagulation – Coumadin**
      - Treatment of choice for individuals with atrial fibrillation who have had a TIA

Cerebrovascular Accident
Nursing Diagnoses

- Ineffective tissue perfusion r/t decreased cerebrovascular blood flow
- Ineffective airway clearance
- Impaired physical mobility
- Impaired verbal communication
- Impaired swallowing
- Unilateral neglect r/t visual field cut & sensory loss
- Impaired urinary elimination
- Situational low self-esteem r/t actual or perceived loss of function

Cerebrovascular Accident
Nursing Goals

- Maintain stable or improved LOC
- Attain maximum physical functioning
- Attain maximum self-care activities & skills
- Maintain stable body functions
- Maximize communication abilities
- Maintain adequate nutrition
- Avoid complications of stroke
- Maintain effective personal & family coping

Cerebrovascular Accident
Warning Signs of Stroke

- Sudden weakness, paralysis, or numbness of the face, arm, or leg, especially on one side of the body
- Sudden dimness or loss of vision in one or both eyes
- Sudden loss of speech, confusion, or difficulty speaking or understanding speech
- Unexplained sudden dizziness, unsteadiness, loss of balance, or coordination
- Sudden severe headache

Cerebrovascular Accident
Acute Phase

- **Assess:** Frequently to assess CVA evolution

Neuro — Glascow Coma Scale -- mental status, LOC, pupillary response, extremity movement, strength, sensation; ICP; Communication—speaking & understanding; sensory-perceptual alterations

CV– cardiac monitoring; VS, PO, hemodynamic monitoring;

Resp — airway/air exchange/aspiration;

GI — swallowing—gag reflex; bowel sounds; bowel movement regularity

GU — urinary continence

Integumentary — skin integrity, hygiene

Coping – individual and family

Cerebrovascular Accident
Acute Phase

- **Nsg Action:**
  - **Supportive Care**
    - **Respiratory – spans from intubation to breathing on own**
    - **Musculoskeletal -- Positioning – side-to-side; HOB elevated; PROM exercise; splints; shoes/footboard**
    - **GI – enteral feedings initially**
    - **GU – foley catheter**
    - **Skin – preventive care**
    - **Meds: anti platelet**

Cerebrovascular Accident
Acute Phase

- **Patient Education:**
  - Clear explanations for all care/treatments
  - Focus on improvements—regained abilities
  - Include family

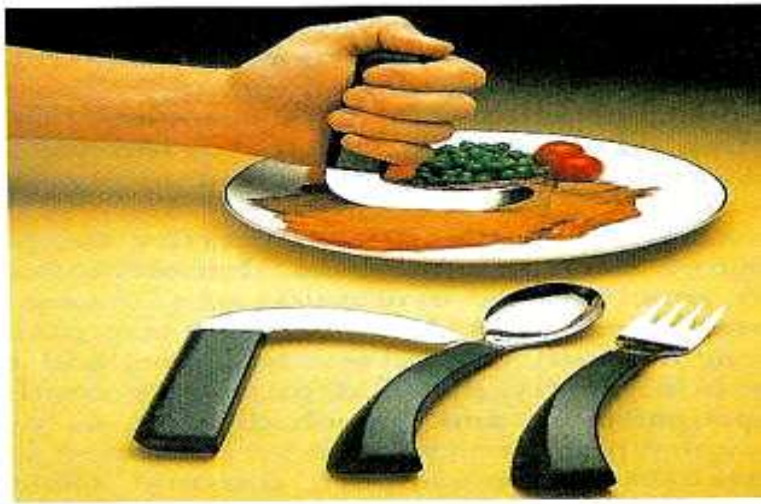
Cerebrovascular Accident
Rehabilitation

- Assess: Swallowing; Communication; Complications; motor and sensory function

- Nsg Action: Coordinate resources:
  - Speech Therapy—assess swallowing
  - Physical Therapy—ambulation/strengthening
  - Bowel/Bladder
  - Appropriate self-help resources

FUNCTIONING
CVS
AFFECTED

Assist CVA client to get out of bed on the functioning vs affected side.



Assistive devices for ealing. **A**, The curved fork fits over the hand. The rounded plate helps keep food on the plate. Special grips and swivel handles are helpful for some persons. **B**, Knives with rounded blades are rocked back and forth to cut food. The person does not need a fork in one hand and a knife in the other. **C**, Plate guards help keep food on the plate. **D**, Cup with special handle.

Cerebrovascular Accident
Rehabilitation

- Comprehensive plan –
  - Physical Medicine & Rehabilitation / Inpatient Rehab
- Learn techniques to self-monitor & maintain physical wellness
- Demonstrate self-care skills
- Exhibit problem-solving skills with self-care
- Avoid complications of stroke
- Communication
- Maintain nutrition & hydration
- Use community resources
- Family cohesiveness

Cerebrovascular Accident
Rehabilitation

- **Resources**
  - American Stroke Association
  - Association of Rehabilitation Nurses
  - National Institute of Neurological Disorders & Stroke
  - National Stroke Association
  - Society for Neuroscience
  - Stroke Clubs International