

## Cardiovascular Accident (CVA) or Stroke

### CVA aka...Stroke or Brain Attack

- o Abrupt onset of neurological deficit from lack of blood supply to a specific part brain
- o Time is tissue. Stroke is an Emergency! Immediate care is critical

### Risk Factors

- o Non-modifiable
  - Gender- males and females both affected
  - Age- advancing age
  - Race: African American, Hispanic, and American Indian
  - Family history-familial
  - Patient History-previous TIA or CVA
- o Modifiable
  - Comorbidities- HTN, Heart disease, Atrial Fib, Diabetes, High Cholesterol,
  - Lifestyle habits-smoking, obesity, alcohol use, poor diet, stress, sedentary lifestyle
  - Oral contraceptives
  - Sickle cell anemia

### Cerebral circulation

- o Review cerebral circulation from A&P
  - Anterior circulation: internal carotid arteries branch into middle cerebral and anterior cerebral arteries
    - Supply: frontal, parietal, temporal lobes, basal ganglia, part of the diencephalon
  - Posterior Circulation: 2 vertebral arteries unite to form basilar artery
    - Supply: cerebellum, brainstem, part of the diencephalon, occipital, parts of temporal lobe
  - Circle of Willis: allows blood to flow from anterior and posterior circulation to protect from differential pressures, occlusion and ischemia
    - Communicating arteries in circle of willis connect anterior and posterior circulation
- o Regulation of cerebral blood flow
  - Factors that affect cerebral blood flow

- Cerebral auto regulation provides protection from systemic BP changes
- Increased CO<sub>2</sub>-leads to increased blood flow and vasodilation, decreased CO<sub>2</sub> levels decrease cerebral blood flow
- Low O<sub>2</sub> levels increase cerebral blood flow to try to correct deficit
- Collateral circulation can happen to compensate for decreased blood flow
- IICP-increased intracranial pressure causes reduced cerebral blood flow

## 2 Classification of strokes: Ischemic and Hemorrhagic

- ❖ **Ischemic** –decrease in blood flow to the brain secondary to partial or complete occlusion
  - Most common type of stroke is ischemic
  - Thrombotic or embolic and TIA is often a precursor
- Thrombotic stroke
  - Thrombus located in a cerebral vessel causes narrowing and occlusion of the blood flow  
Thrombus formation: plaque ruptures, platelet adhesion, clot formation
  - Risk factors- Atherosclerosis, HTN and DM, TIA
  - Characteristics
    - Symptoms progress over period while vessel narrows
      - At 72 hours infarction and cerebral edema peak- slow process
      - Collateral circulation may kick in since thrombotic is a gradual onset
      - No LOC change in first 24 hours because decrease in flow is slow
    - Often occur during or after sleep because the liver works the night shift making clotting factors so clot formation more likely at night time.
- Embolic stroke
  - Occlusion of cerebral artery by embolus, resulting in infarction and edema of area
  - Plaque breaks off from inside layer of heart, enters circulation and lodges when the artery becomes too small or narrows
  - Heart diseases associated with development of emboli:
    - atrial fib/ flutter, MI, Valvular disease and prosthesis, Rheumatic heart disease
    - Endocarditis, atrial septal defects
  - S&S- can occur at any given time, Onset: can be seconds to minutes
  - Investigate underlying cause to treat to prevent reoccurrence
- TIA – Transient Ischemic Attack
  - Temporary (transient) neurological deficit from decrease in blood flow to the brain!

- o Passes without residual effects
- o Warning sign of cerebrovascular disease and a future bigger event like CVA.
- o S&S
  - Diplopia, blurry vision, tinnitus, vertigo, vision loss in 1 eye temporarily
  - Motor and sensory impairments: paresthesia, paresis, ataxia
  - Difficulty talking, swallowing
  - Symptoms are temporary/transient
- o Treatment- prevent platelet aggregation

### ❖ **Hemorrhagic stroke**

- Cerebral hemorrhage causes a lack of blood flow to brain tissue
  - females more than males
  - occur during activity with a rapid onset
  - sudden and severe headache
  - high mortality, two types of hemorrhagic stroke= Intracerebral & Subarachnoid
- o Intracerebral
  - Deep cerebral blood vessel ruptures and bleeds directly into brain tissue
  - Causes:
    - HTN, blood vessel malformations (aneurysm bursts), coagulation disorder, anticoagulants, thrombolytics, trauma, brain tumor
  - S+S
    - Suddenly, progress over minutes to hours due to continued bleeding
    - varies depending on the amount of bleeding, location of bleeding
    - Nausea/Vomit/severe H/A, decreased LOC
    - HTN- the body tries to compensate for the blood loss, bp spikes
  - Complication-blood mass causes compression to the brain
- o Subarachnoid – bleeding into subarachnoid space (between the pia and arachnoid)
  - Usually caused by: ruptured aneurysm
    - Aneurysm-thinning, degeneration of arterial walls, vessel balloons out
      - o Most commonly occur @ circle of Willis
      - o may result from congenital defect or traumatic injury.
      - o many die with initial rupture or rebleeding after a rupture

- o N/V/severe H/A, seizures, and stiff neck
- Complications
  - Cerebral vasospasms occur which worsens the already limited perfusion to brain. Vasospasm narrows vessels causing vasoconstriction
  - second episode of bleeding (rebleeding) is possible and can cause death
- arteriovenous malformation-
  - o tangled web of high-pressure arteries directly connected to veins that create a rupture risk
  - o May result from a traumatic injury, or congenital
- Diagnosis of Stroke
  - o CT- STAT
    - differentiate between ischemic and hemorrhagic stroke rapidly
  - o MRI
    - More accurate to eval extent of damage
    - MRA –magnetic resonance imaging to look at cerebral vasculature
  - o Cerebral Angiogram
    - Catheter threaded from femoral artery to carotid and contrast injected
      - Risk: dislodge emboli, vasospasm, further bleeding, allergy to dye
      - Post procedure assessments
  - o Other Testing
    - Cardiac testing- EKG, CXR, Echo, holter monitor
- Clinical Manifestations of Stroke- can vary depending on:
  - site and size of lesion, presence of collateral circulation
- o Standards
  - Goal-evaluate within 10 min of presenting symptoms
  - (BEFAST) Balance, Eyes, Face, Arms, Speech, Time assessment
  - call 3333 in hospital or 911 outside of hospital
- o Presenting Symptoms
  - unilateral numbness or weakness of face, arm, leg
  - confusion or other change in mental status
  - trouble speaking and/or understanding

- visual disturbances
- difficulty walking, dizzy, loss of coordination, balance issues
- Hemorrhagic Stroke: N/V, seizures, sudden severe headache, htn, +LOC

#### o Motor

- Weakness- contralateral: symptoms of stroke present on the opposite or contralateral side of the lesion because the pyramidal pathways cross at the medulla. R sided weakness correlates with L sided lesion and L sided weakness correlates with R sided lesion
- middle cerebral artery is the only exception to contralateral symptoms
  - greater weakness in the upper extremity is noted compared to lower extremity in an MCA stroke
- Characteristic motor manifestations
  - Impaired voluntary and coordinated movement, loss of tone, could have flaccid extremities or spastic, decreased/impaired reflexes
- Motor effects are unilateral
  - hemiparesis-unilateral weakness
  - hemiplegia- unilateral paralysis
  - initially there is flaccid paralysis- loss of muscle tone, heavy limbs then followed by spastic paralysis-rigid tone, contractures, decreased ROM
- Reflexes –initially hyporeflexic then can progress to hyperreflexic

#### o Communication

- Lt hemisphere controls language in R handed and majority L handed
  - Difficulty with understanding and expressing speech, writing
- Aphasias
  - global aphasias- all language function lost
- dysarthria
  - slurred speech
- Wernicke’s area of the brain -receptive aphasia- temporal lobe lesion
  - speaks fluently but speech may not make sense or he may repeat words or have word salad. “I went to the store, pink, cat, to get milk”
- Broca’s area of the brain– expressive aphasia- frontal lobe lesion

- difficulty speaking, affects speech production. Tries to say “drive” but says d-d-d-dri-drive.
- o Affective Manifestations
  - loss of emotions
  - exaggerated or unpredictable emotional responses
  - emotional reactions complicated by depression/frustration
- o Memory, learning, and judgment may be impaired
  - Can be frustrating/depressing
  - Difficulty making generalizations or with concrete thinking
  - L sided lesion
    - Memory problems r/t language
    - cautious in matters of judgment and slow in processes
    - Think LEFT, LANGUAGE, LENGTHY
  - R sided lesion
    - Problems with space and position
    - Quick and impulsive
    - Deficits with time and judgment
    - Think RIGHT, RAPID
- o Spatial-Perceptual Alterations
  - More with Right hemisphere lesions
  - Incorrect perception of self and illness (brain damage on R side can cause a type of attention deficit)
    - Neglect Syndrome- patient will “deny” their own body parts. May refuse to acknowledge they have a hand or an arm on one side. One hand may not be there in the patient’s eyes/brain/thinking.
  - Incorrect perception of self in space
    - Difficulty determining where they are in regards to others/things
    - Homonymous hemianopsia – blindness occurs in same half of visual field of both eyes (pt only sees ½ of normal vision field).
  - Agnosia
    - Inability to recognize an object / unable attach meaning to object
    - Disorientating situations-holds coffee cup; doesn’t know what to do with it

- Apraxia
        - Inability to perform sequential movements on command
  - Prevention of Stroke is KEY
    - TIA therapy
      - Medications- Antiplatelets medications
        - ASA, Plavix (clopidogrel) and Ticlid (ticlopidine)
          - Oral anticoagulation for those with A-Fib
            - dabigatran (Pradaxa), warfarin (Coumadin)
          - Statins- Zocor (simvastatin) and Mevacor (lovastatin)
      - Surgery
        - Carotid Endarterectomy- remove the plaques in carotid
        - Transluminal angioplasty- Balloon in carotid to open vessel and stent prn
- Acute Care Ischemic Stroke:
  - Maintain patent airway: Oxygenate, Suction, Intubate PRN
  - Neuro Checks/NIH stroke scale as ordered or per stroke protocol
  - Fluid and electrolyte balance
    - Maximize blood volume while being cautious of cerebral edema, IICP
    - ADH secreted in response to stroke causes fluid retention, hyponatremia
    - Hypotonic solutions- (D5W) can lead to fluid retention- caution!
  - Blood pressure- Normal response after stroke for HTN-protective response of body to maintain cerebral perfusion.
    - Antihypertensives in a patient who does not qualify for fibrinolytics only if BP is severely high. Systolic BP > 220 or Diastolic > 120
    - Fibrinolytics-BP has to be a little bit lower, but still can be severely high. Follow orders/protocol at your facility.
    - The high BP is helping to perfuse the brain.
  - Hydration-Adequate amount needed. Watch for overload, can exacerbate cerebral edema
  - IICP more common with hemorrhagic due to blood loss into tissue
    - Position: we want head midline positioned and HOB 30 degrees to help venous drainage in a hemorrhagic stroke patient.
    - diuretics to decrease cerebral edema

- Glycemic control- maintain normal glycemic control to avoid hyper/hypoglycemia
- Hyperthermia- can occur after stroke
- Seizure-antiepileptics, seizure precautions
- Ischemic Stroke Drug Therapy
  - tPA- tissue plasminogen activator (Activase) is the most commonly used med for ischemic stroke
    - lyses the clot and breaks down the fibrin and fibrinogen in thrombus
    - Must be administered within the 3-hour window of the onset of s/s
    - Screening before administering:
      - Coagulation disorder or are they already bleeding?
      - Head trauma, stroke, or GI bleed within last 3 months?
      - Major surgery within 14 days?
    - Closely monitor for S+S bleeding during medication infusion
    - Nursing care: multiple IV sites needed, foley, NGT, Control BP
  - Prevent recurrence of stroke: antiplatelets, anticoagulants, and statins
- Ischemic Stroke Surgical Therapy
  - Mechanical embolus retrieval in cerebral ischemia – MERCI procedure
    - Corkscrew inserted up through femoral artery to the carotid and into the clot area, pulls clot out of body via the catheter tube it was inserted through
  - Angioplasty and stenting open blocked arteries
- Hemorrhagic Stroke Acute Care
  - Similar to ischemic stroke care except no clot buster med! Already bleeding.
  - Maintain BP and optimize cerebral perfusion- BP to <160 SBP
  - Seizure prophylaxis
- Hemorrhagic Stroke Drug Therapy
  - HTN management-antihypertensives
  - Antiplatelet and anticoagulant therapy contraindicated- we want them to clot
  - Nimodipine- Calcium channel blocker. Shown to prevent vasospasm, Hold if SBP <90 or AP <= 60
- Hemorrhagic Stroke Surgical Therapy
  - Evacuate hematomas with craniotomy if > 3 cm

- o Treatment of aneurysm
  - Platinum coils placed in aneurysm via a catheter, decreasing flow to the aneurysm-will kind of close it out. No more burst risk.
  - Clip aneurysm- clip off the blood supply. No more burst risk.
- o AVM treatment
  - Radiation (gamma knife) applied causing AVM to clot off/surgical resection
  - Endovascular Embolization can be done
    - o "super glue" substance inserted into the AVM blood vessels which reduces the AVM size and reduces blood flow so not more burst risk. Closes it off.
- o Complication of hemorrhagic stroke: hydrocephalus, brain herniation, death.
- Nursing Assessment
  - o respiratory, cardiac, and neurologic status
  - o Neurologic status: NIH stroke scale, pupil, cerebellar, CN, DTR function
- Acute Intervention
  - o Respiratory System
    - age, immobility, dysphagia, LOC can put patient at r/f pneumonia
    - NPO to prevent aspiration during acute phase of stroke to prevent aspiration
    - Artificial airway, Suction, position on affected side to aid drooling
    - IS, turn, C+DB- if patient has an untreated aneurysm don't have them coughing on purpose= will increase the ICP.
  - o Neurologic System
    - assess for changes, LOC/Mental Status/Neuro Checks
    - NIH stroke scale- stroke severity, predicts outcomes, and communicates pt status
    - papillary response, motor strength and function, sensory response
  - o Cardiovascular System
    - Fluid balance- gentle watch for fluid overload which can increase ICP
    - DVT prevention- EPC's, medications if ischemic to thin blood
  - o Musculoskeletal System
    - ROM, exercise, when possible, short sessions but start early

- affected side is positioned to prevent dependent edema
- o Integumentary System
  - position to prevent pressure, turning schedule, special mattress, seat cushions
  - hygiene, emollient application, and moving
- o Gastrointestinal System
  - constipation common-we want to prevent this!
  - Fluids Adequate, ~ 2000ml/day but be careful not to overload!
  - Laxatives and stool softeners, suppositories
- o Urinary System
  - Avoid indwelling foley if possible, Avoid retention and overdistention
- o Nutrition
  - Maintain on IV fluids
  - Parenteral (TPN; PPN) or tube feeds PRN
  - Intact gag and swallow reflexes assessed.
  - Speech therapy
  - Procedure for feeding
  - Foods: Easy to swallow, Soft and thickened, No straws
  - Feeding- Place food on unaffected side, Small bites
  - After feeding- Mouth care, Leave upright 45-60 minutes
- o Sensory-Perceptual
  - Homonymous Hemianopsia-visual field loss
    - Place objects in patient field of vision, pt may have blind spot
    - Scan environment to look for hazards
    - Approach from side with intact vision so as to not startle pt
  - Neglect Syndrome
    - check affected side often- could develop sores, injuries
  - Other visual problems-diplopia, loss of corneal reflex, ptosis.
- o Coping

#### Discharge planning

- Rehabilitation
  - o Emphasis placed on client's abilities, Physical, mental, social well-being

- o maintain and restore function and independence
- o Team approach: Client, Family are a vital part of rehab, RN, Physician, PT, OT, ST