CEREBROVASCULAR ACCIDENTS

SUBARACHNOID HEMORRHAGE

Tricia Imanaka-Gong
MSN, RN, CCRN

OBJECTIVES

- Describe the incidence of and risk factors for stroke.
- Explain mechanisms that affect cerebral blood flow.
- Compare and contrast the etiology and pathophysiology of ischemic and hemorrhagic strokes.
- Correlate the clinical manifestations of stroke with the underlying pathophysiology.
- Identify diagnostic studies performed for patients with strokes.
- Describe the collaborative care, drug therapy, and nutritional therapy for a patient with a stroke.
- Describe the acute nursing management of a patient with a stroke.
- Describe the rehabilitative nursing management of the patient with a stroke.
- Explain the psychosocial impact of a stroke on the patient and family.

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

STROKE

- CVA = Stroke = Brain Attack
- When does a stroke occur?
  - Ischemia
  - Hemorrhage
- Functions cease
  - The area of the brain affected will determine the what functions are lost or impaired.

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(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

STATISTICS

STROKE

- Stroke is the 4th most common cause of death in the U.S., ranking behind diseases of the heart and cancer
- There are more than 795,000 strokes each year in the U.S with > 275,000 deaths/year
- 28% of strokes occur in people under age 65
- Over the age of 55, stroke risk doubles every 10 years with 2/3 of all stroke occurring in individuals >65 year of age
- There are more than 7million stroke survivors alive today in the U.S.
- Stroke is the leading cause of long-term disability in the U.S.

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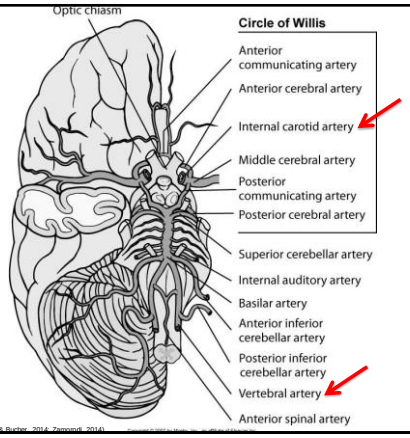
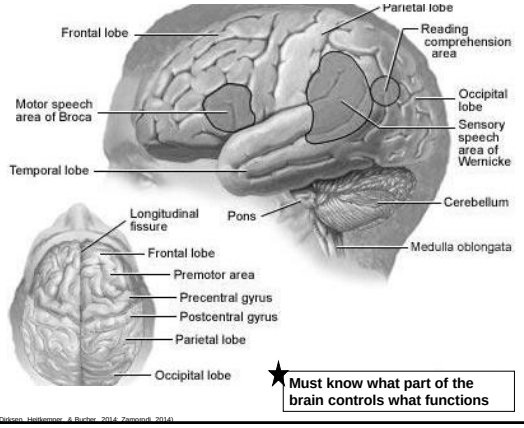
(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

P A T H O P H Y S I O L O G Y



C I R C U L A T I O N

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)



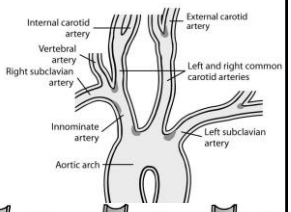
★ **Must know what part of the brain controls what functions**

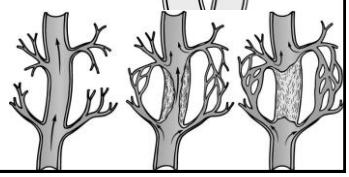
(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

PATHOPHYSIOLOGY

CEREBRAL BLOOD FLOW

- Cerebral requirements
  - Continuous supply of O_2 and glucose
  - Blood flow 750 – 1000 mL/min or 20% of CO
- Mechanisms to maintain/increase blood flow
  - Cerebral autoregulation*
  - Potent Vasodilators
    - Increased CO_2 , low PaO2, and acidosis
  - Blood flow determinants
    - Systemic BP
    - CO
    - Blood viscosity
  - Collateral circulation





(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

PATHOPHYSIOLOGY

CEREBRAL BLOOD FLOW

- CEREBRAL AUTOREGULATION
  - The brains ability to maintain homeostasis
  - Changes in diameter of cerebral blood vessels
- Slows/problems of blood flow
  - Increased ICP
  - Atherosclerosis*

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

RISK FACTORS

NONMODIFIABLE

- Age
- Gender
  - Higher incidences of CVA in ♂ than ♀
- Ethnicity/Race
- Family history
- Heredity

MODIFIABLE

- Hypertension
- Heart disease
- Diabetes
- Increased serum cholesterol
- Smoking
- Excessive ETOH
- Obesity
- Sleep apnea
- Metabolic syndrome
- Physical inactivity
- Poor diet
- Drug abuse

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(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

RISK FACTORS

Conditions associated with stroke risk:

- Atrial fibrillation
- Cardiac valve abnormalities
- Diabetes mellitus

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

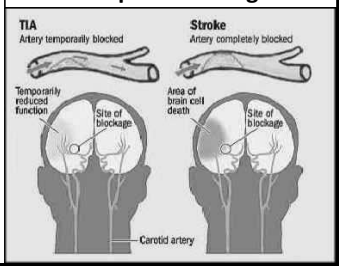
PATHOPHYSIOLOGY

CEREBRAL BLOOD FLOW

- Transient Ischemic Attack (TIA)
  - A temporary focal loss of neurologic function
    - Focal brain injury
    - Spinal cord
    - Retinal ischemia
  - Symptoms usually last less than an hour
  - Absence of acute infarction
  - May be due to microemboli
  - A precursor to worsening cerebrovascular disease
  - Symptoms dependent on area involved

TIA vs CVA

Temporary blockage VS complete blockage



(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

TIA

SYMPTOMS

CAROTID

- Amaurosis fugax
- Transient hemiparesis
- Numbness/loss of sensation
- Sudden inability to speak

VERTEBROBASILAR

- Tinnitus
- Vertigo
- Darkened/blurred vision
- Diplopia
- Ptosis
- Dysarthria
- Dysphagia
- Ataxia
- Unilateral/bilateral numbness/weakness

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

TYPES OF STROKE

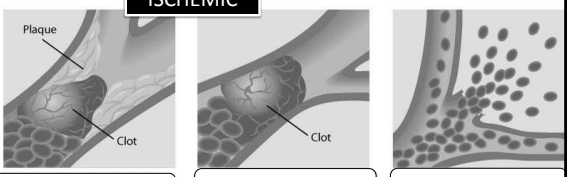
CLASSIFICIATION OF STOKES

- **According to the pathophysiologic findings.**

TWO CLASSIFICATIONS

- ISCHEMIC
  - THROMBOTIC
  - EMBOLIC
- HEMORRHAGIC

ISCHEMIC



Thrombotic | **Embolic** | **Hemorrhagic**

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

TYPES OF STROKE

ISCHEMIC

- Ischemic stroke
  - Thrombotic stroke
  - Embolic stroke
- Inadequate blood flow or partial or complete occlusion of blood to the brain.
- Accounts for 80% of all strokes.

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

TYPES OF STROKE

ISCHEMIC

- THROMBOTIC STROKE
  - Injury to a vessel wall and blood clot formation occurs
  - Thrombosis frequently develops where atherosclerotic plaques developed
  - Infarction occurs if occlusion develops
  - Thrombotic strokes most common 60% of strokes
    - 2/3 of thrombotic strokes are associated with HTN and diabetes
  - 30%-50% of patients have had TIAs

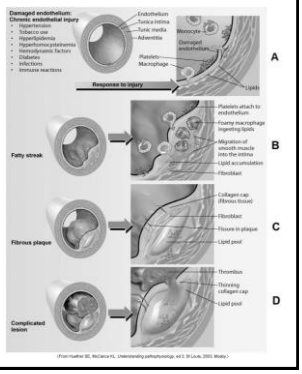
(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

PATHOPHYSIOLOGY

CEREBRAL BLOOD FLOW

- Atherosclerosis
  - Major cause of stroke
  - Hardening and thickening of arteries
  - Penumbra
    - Potentially reversible
- Ischemic cascade

Inadequate adenosine triphosphate (ATP)
↓
Loss of ion homeostasis
↓
Release of amino acids
↓
Free radical formation
↓
Cell death



(From Huether SE, McCance KL. Understanding pathophysiology, ed 3. St Louis, 2003, Mosby.)

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

TYPES OF STROKE

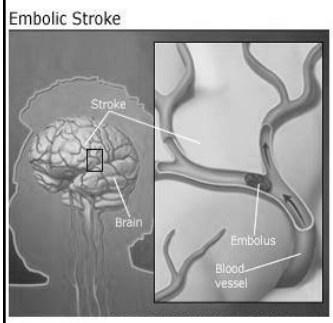
ISCHEMIC

- EMBOLIC
  - Embolus travels and lodges and occludes a cerebral artery
    - Narrow vessel
    - Bifurcation
  - Results in infarction and edema
  - Second most common cause of stroke 24%
  - Majority of emboli originate from in the heart
    - Heart conditions

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

TYPES OF STROKE

ISCHEMIC



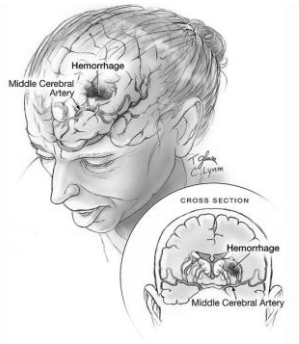
EMBOLIC
- Occurs rapidly
  - Severe clinical symptoms
  - No time for collateral circulation
- Prognosis
  - Dependent on amount of brain deprived of blood
- Recurrence
  - common

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

TYPES OF STROKE

HEMORRHAGIC

- Hemorrhagic strokes account for approximately 15% of all strokes
- Bleeding into:
  - the brain (intracerebral / intraparenchymal) or the
  - subarachnoid space or ventricles



(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

TYPES OF STROKE

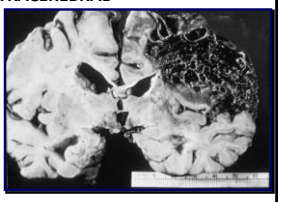
HEMORRHAGIC-INTRACEREBRAL

- INTRACEREBRAL STROKE
  - Bleeding in the brain d/t rupture of a vessel
  - Sudden onset of symptoms
  - Accounts for 10% of all strokes
  - Prognosis is poor
  - Most important causes of intracerebral strokes
  - Occurrence
    - Occurs during activity

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

TYPES OF STROKE

HEMORRHAGIC-INTRACEREBRAL

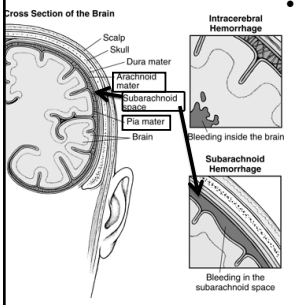


- **Location**
- **Symptoms**

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

TYPES OF STROKE

HEMORRHAGIC-SAH



- SUBARACHNOID STROKE
  - Intracranial bleeding between the arachnoid mater and pia mater
  - Etiology
    - Aneurysms (Silent Killers)
      - the majority occurring at the Circle of Willis
    - Arteriovenous Malformations (AVMs)
    - Trauma
    - Illicit drug use

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

TYPES OF STROKE

HEMORRHAGIC-SAH

- SUBARACHNOID HEMORRHAGE
  - Statistics (ruptured aneurysm)
    - 40% mortality rate for ruptured aneurysms
    - 15% die from subsequent bleeds
    - Incidence increases with age and more prevalent in women
  - No warning symptoms prior to rupture
  - Characteristic of rupture
    - “worst headache of my life”
  - Symptoms-vary

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

TYPES OF STROKE

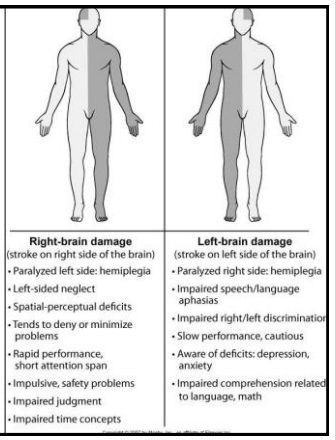
HEMORRHAGIC-SAH

- SUBARACHNOID HEMORRHAGE
  - Significant morbidity
  - Complications
    - Rebleed
    - Vasospasm
  - Survivors often suffer significant complications and deficits.

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

CLINICAL MANIFESTATIONS

- Directly r/t the affected artery and what portion of the brain the artery supplies
- Can effect various functions and varies according to side of brain affected
  - MOTOR/mobility
  - Respiratory function
  - Communication
  - Affect
  - Intellect
  - Spatial-perceptual
  - Elimination
  - Self-care abilities



(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

Clinical Manifestations
Motor Function

- Characteristic motor deficits
  - Loss of skilled voluntary movement
    - Akinesia
  - Impairment of integration of movements
  - Alterations in muscle tone
  - Alterations in reflexes
    - Changes from hyporeflexia to hyperreflexia

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

Clinical Manifestations
Motor Function

- An initial period of flaccidity
  - May last from days to several weeks
  - Related to nerve damage
- Spasticity of the muscles follows the flaccid stage.
  - Related to interruptions of upper motor neuron influence

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

Clinical Manifestations
Communication

- Aphasia occurs when stroke damages dominant hemisphere of the brain and affects language.
  - Receptive – loss of comprehension
  - Expressive – loss of production of language
  - Global – total inability to communicate

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

Clinical Manifestations
Communication

- Dysphasia refers to impaired ability to communicate.
- Used interchangeably with aphasia
  - Nonfluent
    - Minimal speech activity with slow speech
  - Fluent
    - Speech is present but contains little meaningful communication.

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

Clinical Manifestations
Communication

- Many patients experience dysarthria.
  - Disturbance in the muscular control of speech
- Impairments may involve
  - Pronunciation
  - Articulation
  - Phonation

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

Clinical Manifestations
Affect

- Patients who suffer a stroke may have difficulty controlling their emotions.
- Emotional responses may be exaggerated or unpredictable.
  - May be magnified by depression, changes in body image, and loss of function

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

Clinical Manifestations
Intellectual Function

- Both memory and judgment may be impaired as a result of stroke.
- Although impairments can occur with strokes affecting either side of the brain, some deficits are related to the hemisphere in which the stroke occurred.

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

Clinical Manifestations
Spatial-Perceptual Alterations

- Stroke on the right side of the brain is more likely to cause problems in spatial-perceptual orientation.
  - Incorrect perception of self and illness
  - Unilateral neglect
  - Agnosia
  - Apraxia

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

Clinical Manifestations
Elimination

- Most problems with urinary and bowel elimination occur initially and are temporary.
- When a stroke affects one hemisphere of the brain, the prognosis for normal bladder function is excellent.

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorindi, 2014)

DIAGNOSITIC STUDIES

- Purpose of diagnostic studies (table 58-5)
  - Confirmation of stroke
  - Identify cause of stroke
- Non-contrast CT or MRI
  - Size and location of lesion
  - Ischemic Vs. hemorrhagic stroke

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(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorindi, 2014)

Diagnostic Studies

- Other studies
  - CTA or MRA
  - Cerebral angiography
  - Digital subtraction angiography
  - Transcranial Doppler ultrasonography
  - Lumbar puncture
  - LICOX system
  - Cardiac imaging

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorindi, 2014)

COLLABORATIVE CARE

PREVENTION

- Preventative Therapy
  - Decrease morbidity and mortality from stroke
- Goals
  - Increase health promotion for well patients
  - Education and management of modifiable risk factors for stroke prevention

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(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorindi, 2014)

COLLABORATIVE CARE

Prevention-Drug Therapy - TIAs

- Measures to prevent thrombus or embolus formation for patients at risk of CVA
- Patient's with atherosclerosis who had TIAs

- **Antiplatelet drugs**
  - **ASA-most frequently used**
  - **Ticlopidine (Ticlid)**
  - **Clopidogrel (Plavix)**
  - **Dipyridamole (Persantine)**
  - **Dipyridamole and ASA (Aggrenox)**
- **A-Fib + TIA**
  - **Coumadin**
  - **Xarelto**
  - **Pradxa**
- **Statins**
  - **Zocor**
  - **Mevacor**

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(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorindi, 2014)

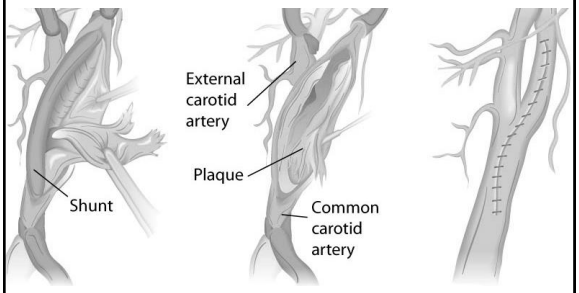
COLLABORATIVE CARE

Prevention-Surgical therapy for patients with TIAs from carotid disease

- Carotid endarterectomy (CEA)
- Stenting
- Transluminal angioplasty
- Extra Cranial-intracranial (EC-IC)

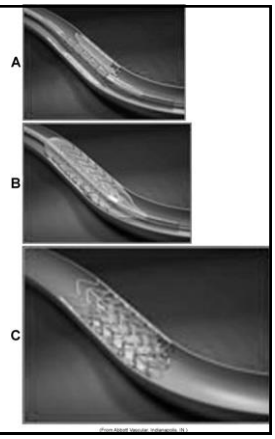
(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorindi, 2014)

Carotid Endarterectomy



(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

STENTING



(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

(From Abbott Vascular, Indianapolis, IN.)

COLLABORATIVE CARE

ACUTE PHASE - ISCHEMIC

- Must know time of onset of symptoms
- TYPICAL GOALS
  - Preserve life
  - Prevent further brain damage
  - Reduce disability
  - Treatment is dependant on type of stroke
  - Emergency Management of Stroke Table 58-7

42

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

COLLABORATIVE CARE
ACUTE PHASE - ISCHEMIC

- ABCs
  - Avoid hypoxia and hypercarbia
- Monitor patient 24-48 hours post stroke
- BP may be elevated (protective response)
- Fluid and electrolyte balance
- Temp
- Seizures
- Pain
- Hypervolemia
- Constipation
- ventriculostomy

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(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorindi, 2014)

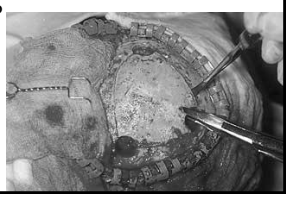
COLLABORATIVE CARE
ACUTE PHASE - ISCHEMIC

- Monitor
  - Increased ICP more likely in hemorrhagic strokes
  - Increased ICP from cerebral edema peaks 72 hours

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorindi, 2014)

COLLABORATIVE CARE
ACUTE PHASE - ISCHEMIC

- Management of Increased ICP
  - Do things to improve venous drainage
    - Elevate HOB
    - Maintain head and neck alignment
    - Avoid hip flexion
    - Manage temp
- Other measure to reduce ICP
  - Medication
    - Pain management
    - Stool softeners
    - Diuretics
  - CSF drainage
  - Bone flap



(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorindi, 2014)

COLLABORATIVE CARE

ACUTE PHASE - ISCHEMIC

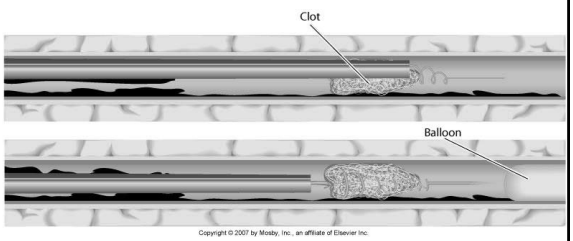
DRUG THERAPY

- Recombinant tissue plasminogen activator (tPA)
  - Used to reestablish blood flow through a blocked artery to prevent cell death
  - Must be administered within 3 to 4.5 hours of onset of clinical signs of ischemic stroke
  - Intraarterial tPA can be given within 6 hours
  - Action
  - Timing
  - Screening of patient
  - Monitoring during infusion

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

MERCI RETREVIER

ACUTE CARE - ISCHEMIC STROKES
SURGICAL INTERVENTION



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(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

COLLABORATIVE CARE

ACUTE PHASE - HEMORRHAGIC

DRUG THERAPY

- Contraindicated
  - Anticoagulants
  - Platelet inhibitors
- Main drug therapy is BP management
  - SBP < 160 (PO and IV)
- Antiseizure drugs
  - Seizure prophylaxis is situation-specific.

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

COLLABORATIVE CARE

ACUTE CARE – HEMORRHAGIC

- Surgical interventions
  - Immediate evacuation of:
    - Aneurysm-induced hematomas
      - Treatment
        - » Resection
        - » Clipping of an aneurysm
        - » Evacuation of hematomas
    - Cerebellar hematomas (>3cm)
    - Arteriovenous malformations (AVM)

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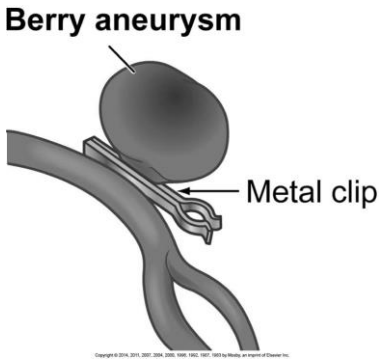
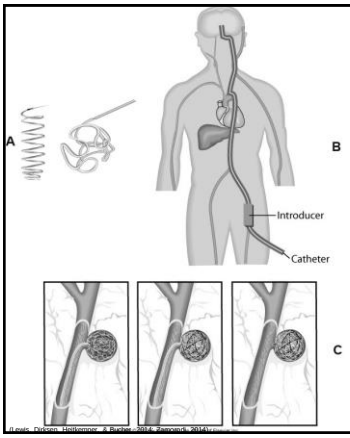
(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

Clipping and Wrapping of Aneurysms



(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

COILING



- **Reduces pulsations**
- **within the aneurysm**

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

ACUTE CARE
Hemorrhagic Stroke

- Prevention of vasospasm
  - Hyperdynamic therapy (HHH)
    - Goals…..by:
      - » Hemodilution
      - » Hypertension
      - » Hypervolemia
  - Drug Therapy
    - Nimotop
  - Ventriculostomy
    - hydrocephalus

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorindi, 2014)

NURSING MANAGEMENT
ASSESSMENT AND DIAGNOSIS

- ASSESSMENT
  - Subjective data
  - Objective data
- See table 58-8, p. 1400
- Nursing Diagnosis

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorindi, 2014)

NURSING MANAGEMENT
Nursing Diagnosis - PLANNING

- Goals
  - Maintain or improve level of consciousness
  - Attain maximum physical functioning
  - Maximize self-care
  - Maintain stable body functions
  - Maximize communication
  - Avoid complications of stroke
  - Effective family and personal coping

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorindi, 2014)

NURSING MANAGEMENT

Nursing Diagnosis - IMPLEMENTATION

- Health promotion
  - Teaching
    - Stroke prevention
    - Identify known risk factors
      - Especially HTN #1 cause of CVA
    - Early warning signs
      - Stroke
      - TIA

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

NURSING MANAGEMENT

IMPLEMENTATION-ACUTE INTERVENTION

RESPIRATORY

- A RN priority
- Risk for:
  - Atelectasis
  - Aspiration pneumonia
  - Airway obstruction
- May need emergency airway management

NEUROLOGIC

- Monitor closely for neurologic changes
- Excellent assessment skills
  - Extension of the stroke
  - ↑ ICP
  - Vasospasm
  - Recovery (pt. improving)
- Use National Institutes of Health Stroke Scale (NIHSS), Table 58-9, P. 1401

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

NURSING MANAGEMENT

IMPLEMENTATION-ACUTE INTERVENTION

CARDIOVASCULAR

- Goal is to maintain homeostasis
- Many have decreased cardiac reserves
- Nursing interventions
  - Monitor VS
  - Monitor Cardiac rhythms
  - Strict I & Os
  - Excellent assessment skills-heart/lung sounds
  - DVT

MUSCULOSKELETAL

- GOAL-optimal function
- Prevent joint contractures and muscular atrophy
- ROM in the acute phase and positioning (passive/active)
  - Paralyzed or weak side needs special attention when positioned
- Preventative measures
  - Examples
    - Trochanter roll at hip
    - Hand cones
    - Posterior leg splints
    - Avoid pulling pt. by arm
    - Hand splints

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorski, 2014)

NURSING MANAGEMENT

IMPLEMENTATION-ACUTE INTERVENTION

INTEGUMENTARY

- Skin breakdown
  - Loss of sensation
  - Decreased circulation
  - Immobility
- Nursing interventions
  - Position changes, special mattresses, wheel chair cushions
  - Good skin hygiene
  - Emollients to dry skin
  - Early mobility
  - Positioning 30 min. on paralyzed side

GASTROINTESTINAL

- Stress of illness contributes to a catabolic state that can interfere with recovery
- Most common
  - bowel problems
    - Stool softeners or fiber
    - Physical activity

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorindi, 2014)

NURSING MANAGEMENT

IMPLEMENTATION-ACUTE INTERVENTION

URINARY

- Acute stage-poor bladder control=incontinence
- Promote normal bladder function
- NO indwelling catheters if possible

NUTRITION

- Assess quickly and initiate treatment
- May need IVF or enteral nutritional support
- First feeding must be extremely careful
  - Speech therapy do a Swallow evaluation, chewing, gag reflex, and pocketing.
  - Place food on unaffected side of mouth
- Must do meticulous oral hygiene

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorindi, 2014)

NURSING MANAGEMENT

IMPLEMENTATION-ACUTE INTERVENTION

COMMUNICATION

- Psychologically – supportive
- Assess patient for the ability to speak and understand
- Speak slow, calmly, use simple words
- Gestures and word or picture boards may be useful

SENSORY-PERCEPTUAL

- Homonymous hemianopsia
  - Loss of vision in same half of visual field
    - Common post stroke
- Other visual problem
  - Diplopia
  - Loss of corneal reflex
  - ptosis

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorindi, 2014)

NURSING MANAGEMENT

IMPLEMENTATION

- AMBULATORY AND HOME CARE
  - COPING
    - May have many losses (sensory/intellectual)
      - Often go through the process of grief
      - Some have long term depression
    - Nurses role
      - Support communication
      - Discuss life changes and changing roles
      - Be an active listener
      - Include family in goal planning and patient care
      - Support family conferences
    - Family members coping

(Lewis, Dirksen, Heitkemper, & Bucher, 2014; Zamorodi, 2014)

REFERNECES

Lewis, S. L., Dirksen, S., Heitkemper, M., & Bucher, L. (2014). *Medical surgical nursing Assessment and management of clinical problems* (9th ed.). St. Louis, MO

Zamorodi, M. (2014). Nursing management stroke. In J. Burt, & F. E. Deno (Eds.), *Medical surgical nursing* (9th, ed., pp. 1388-1412).

QUESTIONS