Stroke Happens: Stroke Evolution Days 2-5

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Disclosures: None
Objectives

• Discuss the current state of stroke, advances in the diagnosis, treatment, prevention and rehabilitation of cerebrovascular disease.

• Interpret the rapidly changing areas within the stroke spectrum such as emerging options for the diagnosis and treatment of acute stroke, mechanisms of stroke recovery.
Evolution of Stroke Care

Basic Facts and Terminology of Stroke

• Stroke is a disease that results with a lack of blood to the brain.

• It is one of the leading causes of death in the US behind heart disease and cancer.

• Approximately 600,000 new strokes and 180,000 recurrent yearly

• A stroke occurs when a blood vessel carrying oxygen and nutrients to the brain either ruptures or is blocked.

• Can be either Ischemic (Clot) or Hemorrhagic (Bleed)
  • 87% Ischemic; 10% ICH, 3% SAH

http://stroke.ahajournals.org
Evolution of Stroke Care

Etiology of Ischemic Stroke

- 20% caused by large-vessel atherosclerosis
- 25% caused by penetration artery disease (small vessel)
  - Lacunar or Subcortical
- 20% caused by cardiogenic embolism
  - Frequently atrial fibrillation
- 30% Cryptogenic (unknown cause)
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Hemorrhagic Stroke

- Causes usually primary ICH or SAH
- 10% ICH
- 3% SAH

Common Risks for Hemorrhagic Stroke

- HTN
- Bleeding disorders
- African-American ethnicity, increasing age, vascular malformations, alcohol abuse, liver problems
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Diagnostic testing
1980’s
• CT Scan,
• Carotid Ultrasound,
• MRI (not widely available),
• 24 hour Holter monitor

Diagnostic testing
2010’s
• CT/CTA/CTP with high resolution/multi-slice
• MRI/MRA(FLAIR, DWI),
• Biplane Angiography,
• TTE/TEE
• Implantable cardiac monitoring for long term monitoring (afib)
Evolution of Stroke Care

Phase 1- Emergency or Hyperacute phase
• First 3 to 24 hours after stroke onset

Phase 2- Acute Care Phase
• Focus on the continued stabilization of the patient
• Frequent neurological evaluations
• Blood Pressure management
• Prevention of complications, or treatment related complications
• Establishing the cause/etiology
• Prevention of secondary stroke

*Stroke, 40(8), 2911-2944*
Complications After Stroke

- Cerebral Edema
- Seizures
- Skin Breakdown
  - Can be located on sacrum, heels, back of head, ears
- Limb Contractures- due to reduced range of motion or lack of exercise
- Angioedema (post tPA)
- Hypertension
- Hyperglycemia
- Dehydration
- Fevers
- DVT/PE
- Falls- the most common complication after stroke
- Pneumonia

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PHASE 2: Acute Care

• Recommendations include following Clinical Pathways or Standing Physician order sets

• Examples can be found at…

• AHA Website: http://www.americanheart.org/presenter.jhtml?identifier=3047992

• Brain Attack Coalition Website

• http://www.stroke-site.org
Phase 2: Acute Care

- 30% of all stroke patients deteriorate within 24 hours
- Post tPA patients should be monitored closely for 24 hours in ICU/Stroke Unit with continuous cardiac monitoring
- Hemorrhagic transformation can occur up to 36 hours post tPA
- Monitor for increasing ICP for patients with large stroke lesions
- If hemorrhage suspected, prepare to transfuse with cryoprecipitate, platelets, and/or PCC
- NIHSS performed by nursing q shift
- Download Neuro Toolkit app for iPhone
Phase 2: Acute Care

Blood Pressure management

- Expect elevation in 40%-80% in all AIS pts for the first 24-48 hours post stroke. Will fall 10-14 days post stroke
- Elevated BP increases cerebral perfusion
- Current guidelines recommend maintaining BP <185/105 for post tPA pts 24 hours
- Non tPA - don’t treat BP unless SBP >220 or DBP >110
- Rapid lowering of BP may induce worsening neurological symptoms by causing lowered cerebral perfusion in the ischemic area
Phase 2: Acute Care

Temperature Management

• Fevers increase ischemic injury to brain cells
• Associated with increased morbidity and mortality
• An increase of 1 degree is a predictor of poor patient outcome
• Maintain normothermia
• Treat for fevers greater than 99.6 degree F
Phase 2: Acute Care

Cardiac Monitoring

- Recommended for all AIS
- Possible arrhythmias include sudden cardiac death, ventricular ectopy, tachycardia, heart blocks, atrial fibrillation
- Right hemispheric infarcts have a higher percentage of possible arrhythmias.
- Holter monitoring recommended post discharge for cryptogenic strokes

Blood Glucose Management

- Outcomes for hyperglycemia worse than normoglycemia (cause/effect not proven)
- Reasonable range of 140 to 180 mg/dL. Monitor closely and avoid any incidence of hypoglycemia
Phase 2: Acute Care

Cerebral Edema

- Common with large infarcts
- Can occur within 24 hours post stroke with large cerebellar stroke or in younger patients
- Peaks 3-5 days post stroke
- Monitor for signs/symptoms of ↑ ICP
  - Change in LOC, worsening neuro deficits, pupillary changes (late sign)
Phase 2: Acute Care

CT Imaging
- Mass effect
- Compression of frontal horns
- Midline shift

Treatment
- Reduce ICP
- Maintain Cerebral perfusion pressure to avoid worsening cerebral ischemia
- Prevent secondary brain injury
- Avoid hypotonic fluids (excess free water)
Management of Increased Intracranial Pressure

Kennedy Neuroscience Program

**Maintain ICP <20/CPP >60 or Per Neurosurgeon/ Neuro-intensivist**

**Level 1 Interventions**
- HOB 30 degrees / midline
- Body Positions (hip flexion)
- Re-level, Re-Zero and/or Trouble shoot transducer

**Level 2 Interventions**
- Phys/PA/NP Management
  - Consider – Case By Case
    - Hyperventilation (EtCO2 monitoring), Decrease PEEP, Increase MV by 20%
  - Consider Sedation (RASS -1)
    - Use Short Acting Titratable Agents
      - Fentanyl, Propofol
  - Consider Increasing CPP by 10-20 mm/Hg
    - Mannitol (0.5-1.5g/kg bolus)
    - 3% Hypertonic Saline (250 cc bolus)
    - 23% Hypertonic Saline (30 cc bolus)
      - Central Line REQUIRED

**Level 3 Interventions**
- Consider Deep Sedation
- Consider Paralysis
- Consider Hypothermia
- Consider Pentobarbital

Modify Factors Associated with Increased ICP
- Valsalva, Coughing, Suctioning, Noxious Stimuli, Hyperthermia, Vasodilating Meds

- ICP >20 sustained >10 min & Evidence of decreased cerebral perfusion OR
- Change in Mental Status
  - Drain CSF and inform physician

**Proceed to Level 2 Interventions**

Adapted from Jefferson University Hospital for Neuroscience
Modified for KUH by EG 3/14
Evolution of Stroke Care
Day 2

- Goals include stabilizing or improvement in neuro status
- Avoiding complications such as fever, infection, bleeding, aspiration
- Completion of initial diagnostic testing- Head CT if pt. received tPA
- Begin discharge planning

- Labs/Diagnostics
- Fasting lipids, homocysteine levels, coags if on anticoagulants
- Consider MRI/MRA
- TEE
- TCD (if Verte/Bas Circ)

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Evolution of Stroke Care
Day 2

- VS and Neuro Checks per unit protocol
- Cardiac monitoring
- Keep pulse ox >95%
  - Pulm toileting
- Avoid Foley (assess bladder/bowel)
- Compression boots
- HOB>30 degrees
- Skin Assessment (turn q2 hr)

Medications
- IVF/IV Heplock
- BP meds (must have parameters)
- SSI as needed
- Acetaminophen 650 prn
- Keep temp <99.6
- Bowel regimen
- If tPA patient, begin antiplatelet

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Evolution of Stroke Care

Day 2

Consults

- Home Health
- Rehab Coordinator
- Neuropsych
- NeuroSurgery
- Vascular Surgery
- Cardiology

Activity

- Bed Rest (HOB up 30 deg)
- Increase activity (with PT eval)
- PM&R if available

Nutrition

- NPO/Asp Precautions- must have a swallow evaluation (nurse driven)
- Advance diet as per Speech/Dietitian recommendations
- Consider Feeding tube if appropriate
Evolution of Stroke Care  
Day 3

Consults
• Completion of all ordered consults from Day 2
• GI if feeding tube needed
• Activity
• Increase activity as tolerated as recommended by PT/PM&R

Nutrition
• NPO/Asp Precautions
• Tube feeding per Dietitian recommendations
• Advance diet as per Speech/Dietitian

Patient/Family Education/D’C plan
• Ongoing Stroke Education
• Anticoag teaching as needed
• Finalize D/C plan
Evolution of Stroke Care
Day 3

• Goals- Neuro status stable or improved
• Move to general floor
• Avoiding medical complications
• Continue with rehab therapies as appropriate
• Pt/Family education
• Discharge if appropriate

Labs/Diagnostics
• Follow any abnormal lab results
• Coags if on anticoagulants
• Consider Modified Barium Swallow
• Angiogram

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Evolution of Stroke Care
Day 3

- VS and Neuro Checks per unit protocol
- Cardiac monitoring (consider d/c)
- Keep pulse ox >95% (may d/c)
- Bowel/Bladder/Skin Assessment
- Avoid Foley
- Compression boots
- HOB>30 degrees
- Hand/Foot splint as per PT/Rehab
- Consider D/C to home

**Medications**

- IVF/IV Heplock or D/C
- Reassess BP meds and parameters
- SSI as needed/restart diabetic med regimen
- Acetaminophen 650 prn
  - Keep temp <100
- Bowel regimen
- Continue appropriate antiplatelet therapy
Evolution of Stroke Care
Day 4-7

Goals
• Neuro status stabilized/improved
• Pt transferred to floor
• Rehab therapy continued
• D/C if appropriate

Labs/Diagnostics
• Cogs if on Anticoagulants
• Consider Barium Swallow

Assessments/Interventions
• as per patient condition and as per protocol

Medications
• Adjust BP meds as needed
• Adjust Diabetic regimen
• Antiplatelet if appropriate

Consults
• Home Health Aid as needed
• Home PT/OT
• Social Work/Rag Dietician
• Case Management
APN Role in AIS

APN role in Patient Stroke Care

- Leads team to develop clinical tools
- Monitors outcomes
- Initiates quality measures and initiatives
- Assist in decreasing LOS
- Assist in decreasing infection rates, skin breakdown, immobility

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APN Role in AIS

• APN Role
  • Can lead research and education
  • Provides consultation to the patient, family and stroke team
  • Key to the development of therapeutic interventions
  • Involved in the discharge planning, and secondary stroke prevention. *Stroke, 40(8), 2911-2944*
Questions?
References

