Acute Complications of Ischemic Stroke

Kartavya Sharma, MD
Assistant Professor of Neurology and Neurocritical care
Objectives

• Recognize acute complications of ischemic stroke

• Identify which patients with acute ischemic stroke require intensive neuro-monitoring

• Learn about the management of the acute complications of ischemic stroke
Disclosures

• None
Outline

• Complications associated with acute reperfusion therapy
  – Orolingual angioedema
  – Symptomatic Intracranial hemorrhage

• Malignant cerebral edema

• Venous thromboembolism

• Dysphagia

• Infection
Orolingual edema
Orolingual angioedema

- Incidence: 1 to 8% of patient receiving IVtPA

- Usually mild and transient

- Increased risk in:
  - patients taking ACE inhibitors
  - stroke location in the frontal/insular cortex

- Timing: Angioedema and anaphylaxis up to 2 hours after IVrtPA infusion, swelling can develop over several hours
Treatment: Orolingual angioedema

• Milder reactions can be closely monitored without stopping infusion

• Severe angioedema, laryngospasm, hypotension
  – immediate stoppage of infusion
  – IV antihistamines (H1 + H2 blocker). Eg: IV diphenhydramine 50 mg + IV ranitidine 50 mg
  – IV corticosteroids. Eg: IV dexamethasone 10 mg
  – Epinephrine 0.3 mg IM epinephrine
  – Endotracheal intubation as clinically indicated
Symptomatic Intracranial Hemorrhage
Symptomatic Intracranial Hemorrhage

• Hemorrhage seen on CT within 36 hours of treatment and deemed temporally related to neurological decline

• Incidence: 6% of patients receiving IVrtPA

• Usually occur within first 24 hours
Parenchymal hematomas > 30% of the infarct volume are associated with increased risk of early deterioration and mortality.
Risk factors

- Higher stroke severity
- Heart disease: CHF, Ischemic heart disease, Atrial fibrillation
- Diabetes mellitus
- Renal failure
- Hypertension in the first 24 hours
- Preceding antithrombotic use
- Thrombocytopenia
- Chronic white matter disease
- Persistent arterial occlusion after IV rtPA infusion
Case 1

- 53 y/o M with history of atrial fibrillation with right sided weakness and facial droop
- IVtPA administered
Case 1

- 8 hours later, sudden decline in mental status
Evaluation and Treatment

• Post treatment protocol: keep SBP < 185 mmHg using IV anti-hypertensives if needed

• If suspected, STOP thrombolytic agent

• If confirmed on imaging, SBP may be managed in accordance with existing ICH guidelines (SBP < 140-160)

AHA/ASA Guidelines 2015
• Reversal of tPA may be attempted before considering surgical hematoma evacuation:
  
  – Cryoprecipitate 10 units
  
  – Check fibrinogen level after reversal. If level < 150 mg/dl, additional cryoprecipitate can be given
  
  – Alternatively, IV tranexamic acid 10 mg/kg OR IV aminocaproic acid 5 g
  
  – Unclear efficacy of PCC, fibrinogen, platelets, FFP
Case 1

- Emergent surgical evacuation of hematoma was performed
Malignant cerebral edema
Malignant cerebral edema

- Incidence: 5-10% of ischemic stroke patients

- Neurologic deterioration often observed between 72 to 96 hours

- Symptoms usually result from tissue swelling and shift of the thalamus and brainstem
  - Increased somnolence
  - Pupillary changes
  - Worsened motor function
• Anticipating high risk patients is important for appropriate triage

• Surveillance at a center with neurologic critical care and neurosurgery is recommended (AHA Class 1, Level C)
Risk factors

- Large vessel occlusion of the terminal carotid or proximal middle cerebral artery

- Large infarct volume (> 1/3 of the MCA territory)

- Head CT with frank hypodensity within 6 hours of stroke onset

- Midline shift of 5 mm or more in the first 2 days
Brain atrophy may be protective

19 y/o  76 y/o  90 y/o
Case 2
- 53 year old male who was found down at home, noted to have left sided weakness

Case 3
- 67 year old male presented with left sided weakness and decreased responsiveness
Management

• Assess airway and consider intubation
• Avoid secondary brain injury from hypoglycemia (goal 140-180 mg/dl) and hypotension
• Maintain normothermia
• Avoid hypercarbia
• Correct hyponatremia
Osmotherapy

- Indicated in patients with clinical or radiographic evidence of swelling

- Mannitol: 0.5 – 1 g/kg IV every 4-6 hours
  - Goal serum osmolarity 310-320 mOsm/L
  - Potential renal toxicity and exacerbation of hypovolemia

- Hypertonic saline (3%, 7.5%, 23.4%)
  - Goal serum sodium 150-155 mEq/l
  - Potential volume overload
Neurosurgical management

- Pooled analysis of 3 RCTs (DECIMAL, DESTINY, HAMLET) of patients aged < 60 years

- Reduced mortality (NNT 2) and increased survival with a modified Rankin Scale of 3 or less (NNT 4)

- No patients had complete freedom from disability
Neurosurgical management

• Early discussions should take place with the care team and patient’s decision maker

• “…..Clinicians may discuss with family members that a third of the patients with massive hemispheric infarctions, even after decompressive craniectomy, are severely disabled and fully dependent on care….”

• “…..The remaining two thirds have potential for recovery after rehabilitation…..”

AHA recommendations 2014
Case 2

- Hypertonic saline 3% solution infused and sodium raised to 158 mmol/L
- Family declined possible surgical intervention
- Continued to have neurological deterioration, loss of brainstem reflexes
- Progressed to brain death on day 2
Case 3

- Hypertonic saline 3% infused and sodium increased to 153
- Neurosurgical consultation: patient and family agreed to hemicraniectomy if needed
Case 3

- No further decline until day 6 after weaning of 3%
- Transferred out of ICU
Decompressive hemicraniectomy: take home message

• Discussion with family and medical decision makers should include realistic expectations for level of disability following surgery

• Patients < 60 y who deteriorate within 48 hours due to malignant cerebral edema despite medical management should be considered for decompressive hemicraniectomy

• Patients > 60 y, careful selection of those with excellent prior baseline function and few or no major comorbidities can be considered
Case 4

• 61 year old man developed sudden onset dizziness, imbalance and nausea
Case 4

• On day 3, he was increasingly somnolent and confused
Case 4

- “Ventriculostomy is recommended in obstructive hydrocephalus after a cerebellar infarct but should be followed or accompanied by decompressive craniectomy….”  
  AHA recommendation 2014

- An External Ventricular Drain (EVD) was placed

- Exam improved to baseline on day 4
Venous thromboembolism
Venous Thromboembolism

- DVT incidence 11% to 15% in the first month. Peak incidence between Day 2 to Day 7 post stroke.

- Half of patients with symptomatic proximal DVT can develop pulmonary embolism.

- 13% to 25% of early deaths after stroke are due to pulmonary embolism. Most commonly encountered between Day 14 to Day 28.
Prophylaxis

• Early mobilization is encouraged in patients who can tolerate activity

• In patients with ischemic stroke with impaired mobility, chemical DVT prophylaxis should be initiated at time of presentation if they do not receive thrombolytic therapy

• LMWH superior to UFH in DVT prevention without increased risk for hemorrhage
Prophylaxis: special considerations

- In patients receiving IV rtPA, initiation of heparin prophylaxis is delayed until 24 hours.

- In patients presenting with ICH, pneumatic compression devices on day 1. Once cessation of bleeding is confirmed, chemical prophylaxis day 2-4.

- Contraindications to heparin use, intermittent pneumatic compression devices have been shown to be effective.

- Contraindication to compression device, aspirin is a reasonable alternative.
VTE treatment

• Therapeutic anticoagulation is recommended in patients found to have a symptomatic proximal DVT

• Risks of anticoagulation: hemorrhagic transformation, hematoma expansion or recurrence, extracranial hemorrhage

• Risk factors for bleeding: Age, stroke size, renal failure, leukocytosis, hyperglycemia
Dysphagia
Dysphagia

• Formal dysphagia screening protocol with a water swallow test significantly reduces risk of aspiration pneumonia

• Early placement of NG/ND tube significantly reduces risk for death
### Stroke Dysphagia Screening

**Part I: Admitting diagnosis and past medical history.**
- Swallow eval already ordered by physician? [Yes/No]
- Suspected Brainstem CVA? [Yes/No]
- Suspected Bilateral CVA? [Yes/No]
- Modified diet/liquids before admission? [Yes/No]
- Aspiration pneumonia? [Yes/No]
- Dementia/confusion? [Yes/No]
- Slurred speech? [Yes/No]
- History of stroke with swallowing difficulty? [Yes/No]

**Part II: Patient evaluation.**
- Is the patient alert and able to follow directions? [Yes/No]
- Is the patient able to be positioned upright? [Yes/No]
- Is the patient able to cough on request? [Yes/No]
- Is the patient able to manage saliva (no drooling)? [Yes/No]
- Is the patient's vocal quality dry (not wet/gurgly)? [Yes/No]

**STOP**
If any of the above responses are No, STOP the screening and make patient NPO (including meds). Please ask physician to order a formal swallow evaluation by speech-language pathology in order entry.

**Part III: Swallow screen.**
- Does the patient have any coughing, choking, throat clearing, or a wet/gurgly voice after:
  - 1 tsp of water? [Yes/No]
  - 1 ounce of water? [Yes/No]
  - 3 ounces of water? [Yes/No]
- Did the patient have any coughing, choking, throat clearing, or a wet/gurgly voice 1 minute after any of the water presentations? [Yes/No]

**STOP**
If any of the above responses are Yes, STOP the screening and make patient NPO (including meds). Please ask physician to order a formal swallow evaluation by speech-language pathology in order entry.

If the patient successfully completes all portions of the screen, a diet may be ordered. The patient's first meal should be supervised. If any change noted in patient's medical or neurologic status, please re-administer the screen.

Evaluated by: _____________________________

Date: ______________ Time: ____________

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Dysphagia screen
Infection
Infection

• Most common cause of fever in the first 48 hours after acute stroke is pneumonia
  
  – Early mobilization and good pulmonary care reduce chances of aspiration, atelectasis

• UTIs occur in 11% to 15% of patients, usually in the first 5 days, up to 3 months. Independent predictor of worse outcomes and prolonged hospitalizations
  
  – Avoidance or early removal of catheters reduces risk
Key points

• Anticipating risk

• Close neuromonitoring

• Early intervention
Bibliography

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