Post-Stroke Complications

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April 9, 2014
Post-stroke complications are the major cause of stroke statistics:

- #3 cause of death in the USA (after heart disease and cancer)
- #1 cause of serious, long-term disability in the USA

80% of strokes are preventable
62F w/ HTN, DM, HPL admitted for large R MCA ischemic infarct. Last known well time was 9 hours prior to admission, prior to going to bed. Exam: T 37.5, HR 95, BP 175/95, R 16, SaO2 96%. Heart RRR, Lungs CTAB, Abdomen soft benign. Neuro: Stuporous, R gaze palsy, dense L face/arm/leg hemiparesis. NIHSS 21
Day 0

BP rises to 215/110. Patient starts to vomit, then shows hypoxia w/ O2 sats down to 91%. GCS down to 8 (E 2-opens eyes to pain, V 2-incomprehensible sounds, M 4- R side flexion, L plegic w/ flexor posturing).
Respiratory Complications

Hypoxemia: 20% of stroke pts in 1st few hours. 66% of pts in first 48 hrs.
- Supplemental O2 (sats > 93%)
- CPAP vs BiPAP (increases Aspiration risk)
- Intubation/mechanical ventilation (rare)
  - if GCS<9 or cannot protect airway

Cause: Aspiration or abnormal breathing pattern
Pneumonia (PNA) vs Pneumonitis

- Most PNA caused by aspiration
  - 3x higher mortality
  - cause = oral flora or gingival bacteria
  - gastric content usually causes pneumonitis (sterile lung injury)

Tx: oral care (antiseptics, chlorhexidine) especially in intubated pts; antibiotics if PNA; anti-emetics for N/V; HOB > 30°.
After intubation, pt develops tachycardia (HR 120’s), frequent PVCs, troponins = 3, EKG w/ ST depressions, T wave inversions, long QTc.
Cardiac Complications
- 2% Myocardial Infarction & Death
- Much higher risk of “Demand Ischemia”, related to NSTEMI Type II
- Arrhythmia: Atrial fibrillation, SVT, ventricular ectopy, V-tach
  - R insula assoc’d w/ more arrhythmia
- CHF exacerbation & new onset
- Stress Cardiomyopathy (Broken Heart Syndrome) = 1-2%, completely reversible
Day 1-2

Pt develops fever 39.1, hypotension (BP 75/40) requiring norepinephrine gtt, acute respiratory distress syndrome (ARDS) w/ O2 sats down to 87% requiring higher ventilatory support.
Fever

• Ischemic stroke pts: 5% develop fever within a few hours, 60% within the first 72 hrs. Higher % in severe stroke.
• Brainstem stroke: central hyperthermia (rapid high fever, fluctuation, high mortality)
• Intracranial hemorrhage (ICH) pts: 90% within first 72 hrs. Also in intraventricular hemorrhage (IVH)
• #1 cause of fever within 1st 48 hrs=PNA
• UTI make up 2nd most common infection
Fever

- Worsens neuronal injury significantly
- Associated with poor outcome
- Normothermia goal very important!
- Induced hypothermia → can lead to infections, hemorrhagic transformation of infarcts, cardiac arrhythmia, & DVTs.
- Therapeutic hypothermia controversial in stroke
Day 3-5

Patient becomes more unresponsive, R pupil now fixed & dilated (confirmed with pupillometry). CT head shows:
Neurologic Complications: Cerebral Edema

- Leading cause of death after stroke within 1st week.
- 10-20% risk in anterior circulation stroke (Middle Cerebral Artery, “MCA”)
- Can quickly lead to herniation in hours.
- If untreated in “malignant MCA infarction”→ mortality up to 80%!!
- Younger patients at higher risk of cerebral edema since less atrophy, less room in calvarium.
Tx of post-stroke cerebral edema

- HOB 30° and neck midline to improve venous drainage
- Tx exacerbating factors: hypoxia, hypercapnia, hyperthermia, hyperglycemia, anti-hypertensive meds
- Osmotherapy w/ hypertonic saline & mannitol (Level 3)
  - 23% NaCl reverses uncal herniation
- Decompressive Hemicraniectomy (Level 1)
  - Best outcome if done early (within 1st 24-48hrs of stroke)
  - Previously thought to only help younger pts (<60 yo), but newest evidence shows that it improves survival in 61-81yo group (Juttler et al., DESTINY II, New England J Med 2014)
Day 6-7

Patient receives hemicraniectomy and neuro exam improves (pt more awake, opens eyes, pupils reactive bilaterally, moving R arm/leg purposefully, L side remains hemiplegic). Then, the next day, she becomes comatose again and has a seizure.
Hemorrhagic transformation
• Occurs in 30-40% of all large vessel acute strokes, though majority are not symptomatic.
• Frequency of symptomatic hemorrhage higher if post-tPA &/or post-embolectomy (6-7%) as compared to no tPA/intervention (1%)
• Increased risk if >65yo, severe stroke, renal failure, or hyperglycemia
Neuro complications cont’d

Seizures
• Early onset (within 1-2 weeks) = 2-23%
• Late onset = 3-67%
• Epilepsy (recurrent seizures) = 2.5-4%
• Stroke=#1 cause of epilepsy in elderly patients
• Tx = antiepileptic medication (AED)
  • If early seizure (in 1st 2 weeks) → 3-6 months of AED
Neuro complications cont’d: Not out of the woods!

Recurrent Stroke

- 1st week: 10% new stroke risk
- 1 month: 2-4% new stroke risk
- >1 month: 5% annual risk of stroke
- Risk factors for recurrent stroke: older age, prior stroke, DM, HTN, Atrial Fibrillation, smoking, cardiac disease, carotid stenosis.
- Important to find source of original stroke, address, and optimize secondary prevention.
After hemicraniectomy and AEDs, pt’s neuro exam improves somewhat, also HR, BP & oxygenation stabilizes. But new sudden onset of tachycardia (HR 120’s), hypoxemia (SaO2 90%, PaO2 51mmHg) occurs. Also pt is agitated, confused, pulled her NG tube, requires restraints.

Day 7-10
Deep Vein Thrombosis (DVT) & Pulmonary Embolism (PE)

DVT incidence = 40% in 1st 3 weeks of stroke, most develop in 1st week.
Risk factors: older age, severity of paralysis, and dehydration
Untreated DVT $\rightarrow$ 15% risk of PE, an important early cause of death in stroke
Most *fatal* PE occur between weeks 2-4 after stroke
DVT & PE Prevention

- Prophylaxis w/ low-dose unfractionated heparin subcut or low molecular weight heparin (LMWH)
- High dose UFH (≥5000u Q8) and LMWH is more effective at preventing DVT, but associated w/ more bleeding (intracranial & extracranial)
- Sequential Compression Devices (SCDs) may be helpful, but 1 trial found no reduction in DVT and 4x higher incidence of skin ulcers, necrosis, and small rise in lower-limb ischemia, especially if peripheral vascular disease.
Post-Stroke Delirium

- Incidence = 13-50%, usually in 1st week of stroke.
- Associated w/ older age, severe stroke, anterior circulation, L hemispheric lesions, meds, sleep apnea.
- Easier to prevent than treat: Re-orient patient, sun exposure, support sleep/wake cycle, encourage family visits
- Tx:
  - Multifactorial approach targeting sleep deprivation (inc sunlight exposure in daytime), immobility, cognitive impairment, visual/hearing impairment, dehydration.
  - Pharmacotherapy: Antipsychotics (haloperidol, quetiapine), Dexmedetomidine gtt
Week 2

Patient improved, extubated, but cannot chew/eat properly and complains of abdominal pains. Also hemoglobin down to 7.2, black stool.
Gastrointestinal Complications: Dysphagia

- 37-78% of stroke patients have dysphagia (long term disability)
- Dysphagia is most frequent after unilateral hemispheric stroke even though swallowing center located in lower brainstem
- NG tube and PEG address nutritional needs
  - Do NOT protect against aspiration PNA
  - No advantage in early PEG vs NG tube
Gastrointestinal Complications: GI Bleed

• 2-3% incidence in stroke
  • worsens morbidity & mortality
  • increases risk of recurrent stroke, DVT, and MI (since antiplatelet agents stopped)
• Risk increased in severe stroke, h/o peptic ulcer disease, cancer, sepsis, renal failure, and abnormal LFTs
• Higher risk in Asian population
• Higher risk in NG tube (lower risk if PEG)
• Cause: delayed gastric emptying, stress ulcers, mucosal irritation from feeds
Gastrointestinal Complications: GI Bleed (cont’d)

- Cause: delayed gastric emptying, stress ulcers, mucosal irritation from feeds
- Prevention: H2 receptor antagonists (e.g. famotidine) and proton pump inhibitors (e.g. omeprazole).

- These meds INCREASE risk of PNA, by normalizing gastric acidity and thereby allowing bacteria to grow and worsen danger of aspiration
Gastrointestinal and Genitourinary Complications:

- **Fecal Incontinence:** 30-56% in first few weeks/months after stroke
- **Urinary incontinence:** common after stroke, increased risk if older, large stroke, and h/o DM and HTN.
- Worsened by meds used for constipation (overflow incontinence), mood/depression.
- **Urinary Tract Infections:** very common in stroke pts!
  - Assoc’d w/ stroke severity, urinary catheters, and female gender. Pt’s usually don’t complain about dysuria, rather get confused/agitated, fever, or other sx’s
Pt gets discharged to skilled nursing facility. She cries at times, begins to complain of pain, and sleeps most of the day.
Depression

- Post-stroke prevalence = 33%
- Under-diagnosed due to impairments in language and cognition.
- Risk increased for women, younger pts, and if more severe disability
- Affect participation in rehabilitation
- Pharmacotherapy (SSRI, TCA) improves mood but not cognition
- Psychotherapy helps to prevent but not treat depression after stroke
Neuropathic pain & musculoskeletal pain
Most common = shoulder & limb pain, especially hemiparetic side
• loss of support to shoulder girdle from muscle paralysis
• joint pain, contracture, spasticity,
• Hip fractures (due to immobility, osteopenia, falls)
• Treatment: resting hand splints, shoulder supports, daily passive range of motion, local heat/ice, analgesics
Major cause of pain & infection: Pressure Sores & Decubitus Ulcers

- Increased risk due to immobility & incontinence
- Pressure sores: sacrum, buttocks, and heels (EXAMINE FREQUENTLY!)
- Prevention & Tx: Q2h turns, early mobilization, padded heel boots, air mattress, wound care nurse.
Fatigue

- **Causes:**
  - Physical deconditioning
  - Side effects of medications
  - Central mechanisms (e.g. Higher incidence of fatigue even if no residual disabilities)
  - Co-existing disorders: depression, anemia, hypothyroidism, adrenal insufficiency, infection, obstructive sleep apnea
  - Treatment: SSRI (i.e. fluoxetine), CPAP, comorbidities
Long term cognitive deficits

- Post-stroke cognitive decline & dementia develops in up to 40% of stroke patients
- Tx of recurrent stroke risk factors (e.g. HTN)
- Rehabilitative measures
- Pharmacologic Tx: cholinesterase inhibitors, SSRI, lipid lowering meds, anti-HTN meds.
- Vascular dementia: 2nd most common cause of dementia after Alzheimer’s disease