SUBARACHNOID HEMORRHAGE (SAH)

(Last updated 08/05/2019; Reviewed by: Sidhant Singh, MD; Bibek Karki, MBBS)

PRESENTING COMPLAINTS: Sudden onset severe headache, nausea, vomiting, altered mentation

FINDINGS

- **A** Check airway, ability to clear secretions
- **B** ↓/↑/N RR
- **C** ↓/↑/N BP, ↑/N HR, weak/N pulse
- **D** Variable altered (V,P,U,D)*, coma
- **E** Neck rigidity
- **L_{PC}** CBC, ABG, Blood Type & Screen, PT/INR, aPTT
- **U_{PC}** Cardiac US may show acute systolic dysfunction

*V (verbal), P (pain), U (unconsciousness), D (delirious)

U_{PC} (point of care ultrasound)  L_{PC} (point of care labs)

DEFINITION: Subarachnoid hemorrhage is a sudden onset of bleeding between the arachnoid and pia matter.

OTHER HISTORY

- **Predisposing factors:** Hypertension, stroke, MI, obese, known history of aneurysm, age > 60 years, smoking, alcohol abuse, cocaine intake, family or personal history of bleeding disorders
- **Symptoms:** Thunderclap headache (“worst headache of my life”), fever, photophobia, nausea, vomiting, neck stiffness, seizures
- **Signs:** Neck rigidity, signs of meningism (Kernig’s and Brudzinski’s sign), papilledema, localizing signs

DIFFERENTIAL DIAGNOSES

Benign headache syndrome, venous sinus thrombosis, pituitary apoplexy, spontaneous spinal fluid leak/CSF hypotension, subdural/extradural/intracranial bleed, meningitis, brain tumor

OTHER INVESTIGATIONS

- **Severity score:** modified Fischer Scale, WFHS, Hunt, and Hess
- **Labs**
  - Blood work: CBC, coagulation parameters, electrolytes, renal function, glucose
  - Lumbar Puncture: performed after CT imaging has been done to rule out increased ICP, xanthochromia present (differentiates SAH from traumatic LP)
- **Imaging:** Non-contrast CT head, CT angiogram, conventional angiogram, baseline chest x-ray
THERAPEUTIC INTERVENTIONS

• Medications
  o Antifibrinolytic: tranexamic acid 1 g q6h until the aneurysm is secured (maximum 72 hours of treatment), alternative agent: aminocaproic acid
  o Antihypertensives (maintain systolic blood pressure <160 mm Hg)
    ▪ IV Push: labetalol 10 mg, hydralazine 10 mg
    ▪ IV Infusion: nicardipine 5-15 mg/h
  o Pain management:
    ▪ Scheduled acetaminophen 1 g q6h
    ▪ PRN: codeine 30 mg q6h; tramadol 25-50 mg q6h
    ▪ Avoid opioid medications to prevent hypoventilation and to decrease the risk of herniation
  o Vasospasm prevention: Nimodipine 60 mg PO q4h; may change to 30 mg q2h if larger dose causes hypotension, continue for 21 days.
  o Fluids/Electrolytes: Maintain euvoletic status
    o Monitor sodium level, given risk for cerebral salt wasting syndrome

• Procedures
  o Aneurysm Evaluation/Treatment
    ▪ Conventional angiography: preferred to complete early, within 24-48 hours of aneurysm rupture
    ▪ Coiling via angiography, if possible; but if not feasible, surgical clipping
  o Hydrocephalus: cerebrospinal fluid diversion with external ventricular drain or lumbar drain

• Contact/Consult: Neurology, neurosurgery, interventional Neuroradiology

• Note: Avoid sedating/neurotropic medications, if possible, to preserve neurologic examination

MANAGEMENT AFTER STABILIZATION

• Follow-up
  o CT/MR angiography or conventional angiography to ensure aneurysm is fully secured
  o Non-contrast CT scans as indicated for neurologic decline

• Further diagnostics
  o Serial neurologic examinations and laboratory monitoring to identify late complications (see below)
  o Echocardiogram if evidence of Takotsubo cardiomyopathy

• Further Treatment
Hydrocephalus: cerebrospinal fluid diversion with external ventricular drain or lumbar drain

Vasospasm: typically delayed and presents between days 4-10 after rupture
  - Treatment: bedrest (typically supine), maintain euvolemic status, hemodynamic augmentation with vasopressors

Cerebral salt wasting: replace fluids, limit free water; replace sodium (e.g. with 1.5% or 3% sodium chloride as necessary); consider fludrocortisone 0.2 mg BID for a one-week course

• Manage Complications
  o Rebleeding: highest risk within 48 h of aneurysm rupture, maintain BP <160 mm Hg systolic, secure aneurysm early
  o Hydrocephalus: divert cerebrospinal fluid with drainage as above
  o Cerebral salt wasting, as above: free water restriction, hypertonic fluid replacement, fludrocortisone, maintain euvoeemia
  o Takotsubo cardiomyopathy: for pulmonary edema can provide positive airway pressure, cautious use of diuresis to avoid increased risk of vasospasm

• Prophylaxis
  o Sequential compression devices and compression stockings initially
  o Once aneurysm is secured, pharmacologic prophylaxis can be started if no other contraindication; not allowed immediately post-operatively, heparin use is surgeon-dependent if an external ventricular drain or lumbar drain are in place
  o Stress ulcer prophylaxis is not routinely indicated unless the patient is intubated

CAUTIONS
• Complications: Common: vasospasm and hydrocephalus; Systemic complications: Takotsubo (stress-induced) cardiomyopathy and hyponatremia due to cerebral salt wasting

REFERENCES AND ACKNOWLEDGMENTS
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