

# 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<sub>PC</sub>** CBC, ABG, Blood Type & Screen, PT/INR, aPTT
- **U<sub>PC</sub>** Cardiac US may show acute systolic dysfunction

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

**U<sub>PC</sub>** (point of care ultrasound) **L<sub>PC</sub>** (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**

- Antifibrinolytic: tranexamic acid 1 g q6h until the aneurysm is secured (maximum 72 hours of treatment), alternative agent: aminocaproic acid
- Antihypertensives (maintain systolic blood pressure <160 mm Hg)
  - IV Push: labetalol 10 mg, hydralazine 10 mg
  - IV Infusion: nicardipine 5-15 mg/h
- 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
- Vasospasm prevention: Nimodipine 60 mg PO q4h; may change to 30 mg q2h if larger dose causes hypotension, continue for 21 days.
- **Fluids/Electrolytes:** Maintain euvolemic status
- Monitor sodium level, given risk for cerebral salt wasting syndrome

- **Procedures**

- 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
- 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**

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

- **Further diagnostics**

- Serial neurologic examinations and laboratory monitoring to identify late complications (see below)
- 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**
  - Rebleeding: highest risk within 48 h of aneurysm rupture, maintain BP <160 mm Hg systolic, secure aneurysm early
  - Hydrocephalus: divert cerebrospinal fluid with drainage as above
  - Cerebral salt wasting, as above: free water restriction, hypertonic fluid replacement, fludrocortisone, maintain euvolemia
  - Takotsubo cardiomyopathy: for pulmonary edema can provide positive airway pressure, cautious use of diuresis to avoid increased risk of vasospasm
- **Prophylaxis**
  - Sequential compression devices and compression stockings initially
  - 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
  - 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

Acknowledgement: *Sherri A. Braksick, MD; Xavier Fonseca, MD; Alejandro A. Rabinstein, MD*

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