

## **Comprehensive Recommendations**

### **Medical Measures to Prevent Rebleeding**

1. Early aneurysm repair should be undertaken, when possible and reasonable, to prevent rebleeding. <sup>1,2,3,4,5,6</sup>
2. If unavoidable delay in obliteration of aneurysm and no contraindications, short-term (<72 hours) therapy with tranexamic acid or aminocaproic acid is reasonable to reduce the risk of early aneurysm rebleeding. <sup>1,2,3,6</sup>
3. Titratable BP drips should be used. <sup>2</sup> Optimal pre-secure SBP targets unclear: MAP < 110<sub>1</sub>, SBP < 160<sub>2</sub>, SBP < 160 & MAP > 70<sub>3</sub>, SBP < 140<sub>5</sub>.

### **Seizures and Prophylactic Anticonvulsant Use**

Prophylactic dilantin has poorer outcomes, but opinions mixed about brief user of newer agents. Most centers use nothing or Keppra.

### **Surgical/Endovascular Tx of rupture cerebral aneurysms**

1. Complete obliteration is the goal. <sup>2</sup>
2. Coiling over clipping when possible but should be a multidisciplinary decision. <sup>2</sup>
3. Follow-up imaging after coil/clip and possible retreatment should be considered if lesion still exists. <sup>2</sup>
4. Stenting of a ruptured aneurysm is associated with increased morbidity and mortality, and should only be considered when less risky options have been excluded. <sup>2</sup>

## DCI/Vasospasm Prevention

1. Oral nimodipine 60mg q 4 x 21d. 1,2,3
2. Goal is euvolemia. 1,2,3,5 Hypovolemia and hypervolemia are dangerous. 1,2,3,6
3. Strict I&Os. 1,2,5
4. Routine CVP and PA catheter are not required. 1
5. Trend TCDs. 1,2,5
6. Use CTA and CT perfusion to increase detection. 1,2
7. Prophylactic triple-H or angioplasty is not recommended. 1,2,3,6
8. Continue statin if patient uses chronically. 1,3
9. Avoid hypomagnesemia. 1
10. Peri-operation antibiotic prophylaxis should be used. 3
11. None of these sources use nitroglycerine. As it is known to increase ICP, some feel it would be contraindicated. 6

## Hemodynamic Management of DCI/Vasospams

1. Goal is euvolemia although initial fluid bolus is reasonable. 1,2,3
2. Induced hypertension is primary treatment. 1,2 20% above baseline to max 220/120. 3,5,6
3. Reduce or stop nimodipine if it is causing hypotension. 1
4. Hypovolemia shouldn't be used. 1,2,3,6
5. Endovascular treatment is reasonable if refractory to medical therapy. 1,2
6. Keep Hb > 8-10 1,2,3 although higher Hb may be dangerous.
7. Nobody recommending nitroglycerine.

## Deep Venous Thrombosis Prophylaxis

1. Everybody gets SCDs. 1,3
2. Hold meds prior to surgery. 1,3
3. Start SQ heparin or lovenox 24hrs after surgery. 1,3

## Routine Medical Care

1. As cardiac dysfunction as common, everybody should get cardiac enzymes and an echo. <sup>1,3</sup>
2. With any evidence of pulmonary edema or lung injury excessive fluids should be avoided and treated with diuretics as needed. <sup>1</sup>
3. CHF treatment should be used while keeping BP up if needed. <sup>1</sup>
4. Unclear safety or benefit of initial high dose steroids. <sup>4,5</sup>
5. Aggressive fever control. Tylenol and ibuprofen first. Surface or intravascular catheter if needed. Prevent shivering. <sup>1,3</sup>

## Hyponatremia / Endocrine

1. No fluid restriction. <sup>1</sup>
2. Hydrocortisone or fludrocortisone should be considered. <sup>1,3</sup>
3. Avoid hypotonic fluids. <sup>2</sup> Hypertonic fluids can be used. <sup>1,2</sup>
4. If vasopressin-receptor antagonists are used, be careful to avoid hypovolemia. <sup>1</sup>
5. Adrenal shock should be considered in hypotensive patients or in induced HTN. <sup>1</sup>
6. Goal glucose unclear. Tight (80-110) increased vasospasm but poor control (> 200) had worse outcomes. <sup>1,3</sup>

## Sources

1. Critical Care Management of Patients Following Aneurysmal Subarachnoid Hemorrhage: Recommendations from the Neurocritical Care Society's Multidisciplinary Consensus Conference. *Neurocrit Care* (2011) 15:211–240.
2. AHA/ASA Guideline: Guidelines for the Management of Aneurysmal Subarachnoid Hemorrhage. *Stroke* (2012). <http://stroke.ahajournals.org/content/early/2012/05/03/STR.0b013e3182587839>.
3. Managing Subarachnoid Hemorrhage in the Neurocritical Care Unit. *Neurosurg Clin N Am* 24 (2013) 321–337.
4. Cochrane Database on SAH. <http://www.thecochranelibrary.com/details/browseReviews/578155/Subarachnoid-haemorrhage.html>.
5. Bradley Kolls, MD. Duke. Personal correspondence.
6. Neeraj Badjatia, MD. Maryland Shock/Trauma. Personal correspondence.