Use of Nimodipine in Subarachnoid Hemorrhage: A Review

Learning Objectives

1. Describe the etiology, diagnosis, and clinical presentation of subarachnoid hemorrhage (SAH);
2. Discuss the usual treatment of SAH, including associated complications;
3. Explain the role of nimodipine in the treatment of SAH;
4. Review the efficacy and safety concerns associated with the traditional administration of nimodipine for SAH; and
5. Explain the role of nimodipine oral solution (Nymaliz) for improving efficacy and safety during the treatment of SAH.

Post-test/Rationale

1) Risk factors for the development of aneurysmal subarachnoid hemorrhage (SAH) include all of the following, EXCEPT:
   A. Hypertension
   B. Male gender***
   C. Smoking
   D. Genetic/familial factors
   E. Stimulant use

Correct Answer: B

Women are more prone to presentation with aneurysmal SAH at a rate 1.6x that of men, according to most studies.

2) All of the following are characteristic signs and symptoms of SAH, EXCEPT:
   A. Headache
   B. Neck stiffness
   C. Photophobia
   D. Bilateral weakness***
   E. Seizure

Correct Answer: D

Patients with more severe SAH may present with stroke-like symptoms, including hemiparesis.
3) Immediate treatment and stabilization of patients with aneurysmal SAH prior to surgical intervention should include which of the following:
   A. Reduction of the mean arterial pressure no greater than 25% less than the mean arterial pressure at admission
   B. Nimodipine 60 mg by mouth (PO), every 4 hours (q4h) for 21 days
   C. Fluid resuscitation to a central venous pressure of 8 to 12 mm Hg
   D. Reduction of the systolic blood pressure to less than 140 mm Hg***
   E. Tranexamic acid 1 gm intravenously

Correct Answer: D

Reduction of the systolic blood pressure to < 140 mm Hg is analogous to treatment thresholds currently suggested for the management of intracerebral hemorrhage. Abrupt blood pressure reduction can lower the risk of rebleeding early in presentation of the condition. Tranexamic acid has not been proven beneficial in the acute setting of aneurysmal SAH.

4) All of the following are common medical complications associated with aneurysmal SAH, EXCEPT:
   A. Hyponatremia
   B. Fever
   C. QTc prolongation
   D. Hydrocephalus
   E. Acute renal failure***

Correct Answer: E

Acute renal failure is uncommon in patients with aneurysmal SAH. In fact, most of these patients appear to have augmented renal clearance.

5) Which of the following would be an appropriate treatment consideration for a patient with cerebral vasospasm:
   A. Fluid boluses to maintain hypervolemia
   B. Inotropic agent to ensure adequate cerebral perfusion***
   C. Increase the nimodipine dose to 60 mg every 2 hours
   D. Antiepileptic drugs
   E. None of the above

Correct Answer: B

While inotropic agents are not first-line for the treatment of cerebral vasospasm, milrinone or dobutamine may be used to either augment compromised cardiac function or provide hyperdynamic therapy to ensure adequate cerebral perfusion.
6) Which of the following agents has consistently shown benefit in large, randomized clinical trials for the treatment of patients with aneurysmal SAH:

A. Nimodipine***
B. Albumin
C. Simvastatin
D. Magnesium
E. Clazosentan

Correct Answer: A

Nimodipine has been shown to decrease delayed neurologic deficits after aneurysmal SAH.

7) Which of the following is the standard dose of nimodipine for a patient with aneurysmal SAH:

A. 60 mg q4h for 21 days***
B. 30 mg q4h for 21 days
C. 60 mg q4h until vasospasm subsides
D. 30 mg q2h for 21 days
E. None of the above

Correct Answer: A

Nimodipine should be given orally or enterally at a dose of 60 mg every 4 hours for 21 days, regardless of the presence of vasospasm. Alternative doses, such as 30 mg every 2 hours, may be considered in the case of adverse events, but are not standard.

8) Bedside extraction of nimodipine is associated with which of the following:

A. Increased accuracy of dosing
B. Increased nursing satisfaction
C. Inadvertent intravenous administration***
D. More rapid administration
E. None of the above

Correct Answer: C

The FDA included a black-box warning on the nimodipine labeling, warning practitioners against inadvertent intravenous administration of nimodipine.
9) Which of the following is the most appropriate method of bedside nimodipine solution 
extraction from the capsule:
   A. Puncturing with a needle
   B. Soaking in water
   C. Use of tablet crusher
   D. 5 seconds on medium power in microwave
   E. None of the above***

Correct Answer: E

None of the options above are optimal. First, because beside extraction should not be done. Second, because puncturing the capsule with a needle often results in needlesticks and manipulation of the product by water or heat may change the nature or concentration of the solution in the capsule. A tablet crusher will not liberate the capsule contents in a manner suitable for extraction and administration.

10) Which of the following is correct regarding the new commercial nimodipine product 
(Nymalize):
    A. It can be administered intravenously
    B. It is strawberry flavored
    C. It must be pulled into syringes by the pharmacy
    D. It is more time efficient than pharmacy-initiated nimodipine extraction***
    E. None of the above

Correct Answer: D

Nymalize comes as a premade 60 mg/20 mL solution that is ready to use. This could save the pharmacy time by not requiring a technician or pharmacist to extract nimodipine solution from capsules in bulk.