Cerebral Vasospasm Guidelines

see Hypervolemia for vasospasm

Induced hypertension for vasospasm

Nimodipine for vasospasm

Transcranial doppler for vasospasm diagnosis

Vasospasm diagnosis

In 2012, the American Heart Association and the American Stroke Association published updated evidence-based guidelines on the comprehensive management of aneurysmal subarachnoid hemorrhage (aSAH), including the management of cerebral vasospasm and delayed cerebral ischemia (DCI).

These guidelines have been endorsed by the American Association of Neurological Surgeons, the Congress of Neurological Surgeons, and the Society of NeuroInterventional Surgery.

Current recommendations for management of cerebral vasospasm and DCI after aneurysmal subarachnoid hemorrhage (aSAH) are as follows:

Oral nimodipine should be administered to all patients with aSAH (class I; level of evidence).

A) - It should be noted that this agent has been shown to improve neurologic outcomes but not cerebral vasospasm; the value of other calcium antagonists, whether administered orally or intravenously, remains uncertain Maintenance of euvolemia and normal circulating blood volume is recommended to prevent DCI (class I; level of evidence,

B) - Revised recommendation from previous guidelines Prophylactic hypervolemia or balloon angioplasty before the development of angiographic spasm is not recommended(class III; level of evidence,

B) - New recommendation Transcranial Doppler is reasonable to monitor for the development of arterial vasospasm (class IIa; level of evidence,

B) - New recommendation Perfusion imaging with computed tomography (CT) or magnetic resonance imaging (MRI) can be useful to identify regions of potential brain ischemia (class IIa; level of evidence,

B) - New recommendation Induction of hypertension is recommended for patients with DCI unless blood pressure is elevated at baseline or cardiac status precludes it (class I; level of evidence,

B) - Revised recommendation from previous guidelines Cerebral angioplasty and/or selective intra-arterial vasodilator therapy is reasonable in patients with symptomatic cerebral vasospasm, particularly those who are not rapidly responding to hypertensive therapy (class IIa; level of evidence,
B) - Revised recommendation from previous guidelines

Level of Evidence 1

Level of Evidence 1:

Maintain euvolemia and normal circulating blood volume.

Induced hypertension unless blood pressure is elevated at baseline or if precluded by cardiac stents [1].

Level of Evidence 2

Level of Evidence 2:

Endovascular angioplasty and or selective intraarterial vasodilator therapy is reasonable for patients not responding rapidly to or candidates for induced hypertension.

Management

Patients with clinical suspicion of vasospasm (DIND), or with transcranial doppler increases 0f > 50 cm/sec or with absolute velocities > 200:

Serial neuroexams: while important, sensitivity for CVS/DCI is limited in poor grade patients [2].

Bed rest, HOB elevated to ≈ 30º.

TED hose and/or sequential compression boots.

Strict I and O measurements

STAT non contrast head CT to rule out hydrocephalus, cerebral edema, cerebral infarct or rebleed

Option: Perfusion CT or MRI.

STAT bloodwork

Electrolytes to rule out hyponatremia [3].

CBC to assess rheology and rule out sepsis or anemia.

ABG to rule out hypoxemia.

Repeat TCD to detect changes indicative of vasospasm.

Arterial line to monitor BP.

Pulmonary artery catheter to monitor Pulmonary wedge pressure and cardiac output when possible (central line to monitor CVP when pulmonary artery catheter cannot be placed).

Insert ICP monitor if ICP felt to be problematic, treat elevated ICP with mannitol or CSF drainage

before institution hemodynamic augmentation (caution: the diuresis from mannitol in treating ICP may produce hypovolemia; also, exercise caution in lowering ICP with unsecured aneurysm).

Continue nimodipine therapy. Give via nasogastric tube if pt unable to swallow.

Administer oxygen to keep PO2 > 70 mm Hg.

Ensure euvolemia: Patients with SAH often develop hypovolemia early in their course [4) 5) 6)].

Primary IV fluid is crystalloid , usually isotonic (e.g. Normal Saline).

Blood (whole or PRBC) when hematocrit drops < 40 %.

Colloid: Plasma fraction or 5 % albumin (at 100 ml/hr) to mantain 40 % Hct (if HCt is > 40 %, use crystalloids [7)].

Mannitol 20 % at 0,25 gm/kg/hr as a drip may improve rheologic properties of blood in the microcirculation (avoid hypovolemia from resultant diuresis).

Replace urinary output with crystalloid (if Hct < 40 %, than use 5 % albumin, usually @ ≈ 20-25 ml/hr)

Avoid Hetastarch (Hespan®) and dextran which impair coagulation.

ABG and H/H daily

Serum and urine electrolytes and osmolalities q 12 hr (creatinine elevations may indicate peripheral ischemia from vasopressors).

CXR daily

Frequent EKG

Initiate Hemodynamic augmentation (Triple H is a old concept) unless BP is elevated at baseline or cardiac stents preclude it) for 6 hours.

If no response to 6 hrs of Hemodynamic augmentation (Triple H is a old concept), or if Doppler or perfusion CT or MRI suggests vasospasm, patient is taken to angiography to confirm presence of vasospasm and for interventional neuroradiologic treatment (intraartrial verapamil, angioplasty….).

Move patient to the ICU and placed on hemodynamic augmentation (Triple H is a old concept) for 6 hours if this is not already instituted.

Option Perfusion CT or MRI.

If no response to 6 hrs of Hemodynamic augmentation, or if Perfusion CT suggest vasospasm patient is taken to angiography to confirm presence of vasospasm and for interventional neuroradiological treatment (intraarterial verapamil, angioplasty…)

[1)], [2)]

Connolly ES Jr, Rabinstein AA, Carhuapoma JR, Derdeyn CP, Dion J, Higashida RT, Hoh BL, Kirkness CJ, Naidech AM, Ogilvy CS, Patel AB, Thompson BG, Vespa P; American Heart Association Stroke Council; Council on Cardiovascular Radiology and Intervention; Council on Cardiovascular Nursing; Council on Cardiovascular Surgery and Anesthesia; Council on Clinical Cardiology. Guidelines for the

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