

Is Triple H Therapy still relevant in preventing & treating vasospasm? current status

Dhaval Shukla

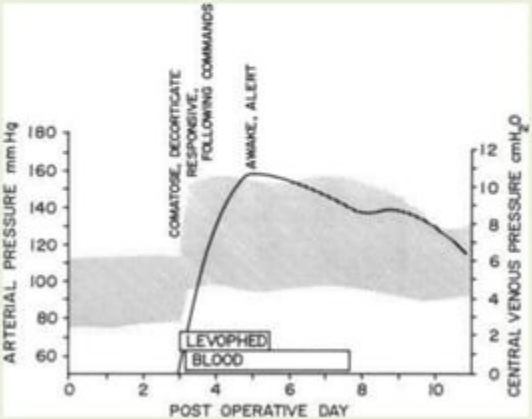
NIMHANS, Bangalore

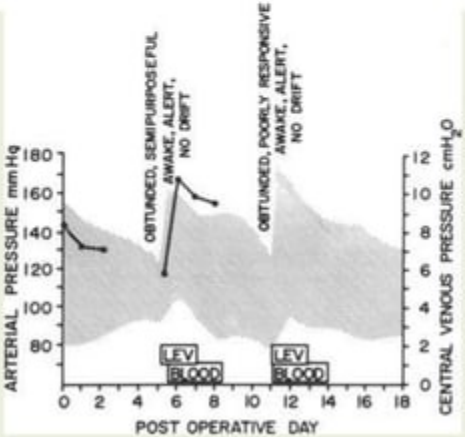
Postoperative hypertension in the management of patients with intracranial arterial aneurysms

J. Neurosurg. / Volume 45 / August, 1976

EDWARD J. KOSNIK, M.D., AND WILLIAM E. HUNT, M.D.

Department of Surgery, Division of Neurological Surgery, Ohio State University College of Medicine, Columbus, Ohio





Kosnik AJ, et al. JNS 1976

3-H Original Protocol

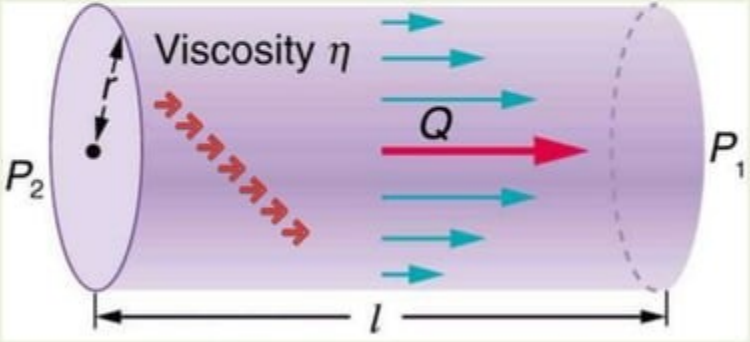
- Elevate the SBP 40 to 60 points upto 250 mm Hg
- As much as 3 L transfusion with colloid and/or blood is necessary (regardless of normal hematocrit) in the first 24 h in addition to daily maintenance fluid
- Autoregulation is poor or absent in these patients, and that CBF therefore follows the MAP
- Increasing CPP is the most effective available treatment, provided it is instituted before vascular membranes are extensively damaged
- Caution in the use of this technique is advised, since the regimen is not without risk

Kosnik AJ, et al. JNS 1976

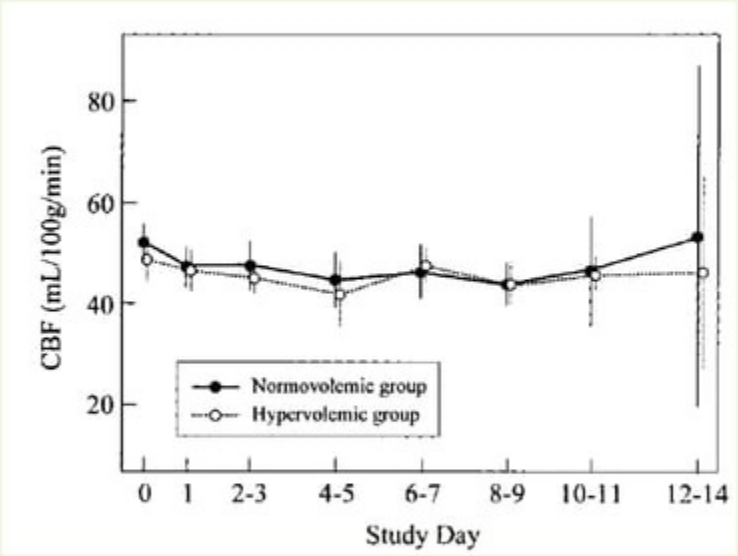
3-H Therapy

- 3-H became the mainstay in the prevention and treatment of cerebral vasospasm

- Hypervolemia
- Hypertension
- Hemodilution



Hypervolemia - RCT



There was no difference in symptomatic vasospasm

Lennihan L, et al. Stroke 2000.

Hypervolemia

Increased risk of complications

- Pulmonary edema
- Cardiac
- Arrhythmia
- Congestive heart failure
- Cerebral edema
- Sepsis

Hypervolemia

- No difference in designated clinical endpoints between the two therapies

- Hypervolemia does not improve and might even worsen cerebral oxygenation
- Hypervolemia is associated with complications

Careful fluid management to avoid hypovolemia may reduce risk of DCI after SAH

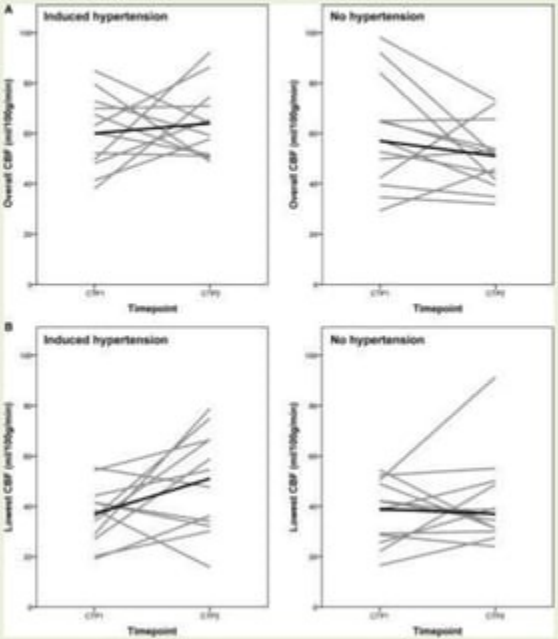
Prophylactic hypervolemic therapy is unlikely to confer an additional benefit

Hemodilution [Hematocrit 30]

- 40%–50% of patients with SAH develop anemia during in ICU
- Age, sex, surgery, and blood drawing for investigations
- Anemia has been **associated** with increased **morbidity** because of infarction, disability, and eventually death
- **Low** brain tissue **oxygen** because of anemia, leading to **neuronal injury** in patients with acute brain injury
- Optimal Hb concentration is still a matter of debate
- Target Hb >10 g% is a reasonable option

Chugh C, et al. Neurol India 2019.

Induced Hypertension iHT - RCT



- Poor outcome at 3 months (mRS>3)
- 30-day case-fatality
- Barthel Index
- Stroke Specific Quality of Life Scale
- Hospital Anxiety and Depression Scale
- Cognitive Failures Questionaire

Gathier, et al. Stroke 2018.

Induced Hypertension

Complications

- Cardiac arrhythmia
- Pulmonary edema
- Hemorrhagic transformation
- Intracranial bleeding

iHT is a labor-intensive treatment

There is still no evidence that iHT improves outcome in patients with DCI

High rate of serious complications associated with iHT

Widespread use of iHT in aSAH patients with DCI and the pertinent guideline recommendations may require reconsideration

3H Therapy RCT

Intervention

- 1000 to 1500 ml of colloids
- dopamine, 5–15 microg/kg/min

Target

- CVP 8 -12 cm H_2O
- Hematocrit 30 -35%
- MAP >20 mm Hg

Outcome –No Difference

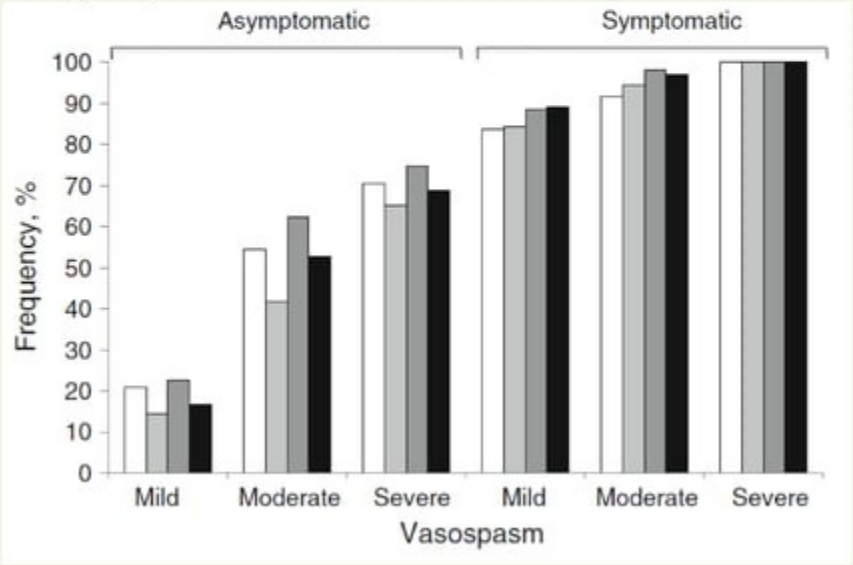
- Cerebral vasospasm
  - – Clinically/ TCD
- CBF
- GOS at 1 year
- Neuropsychological

Cost and Complication

Egge A, et al. Neurosurgery 2001.

Current Practices of 3-H Prophylaxis and Therapy in Patients with SAH

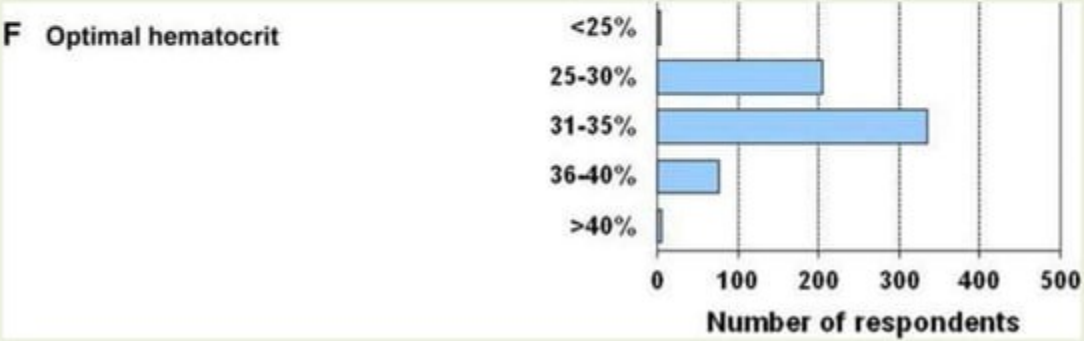
- Members of the Neurocritical Care Society
- 167 (45%) respondents



Meyer, et al. Neurocritical Care 2011.

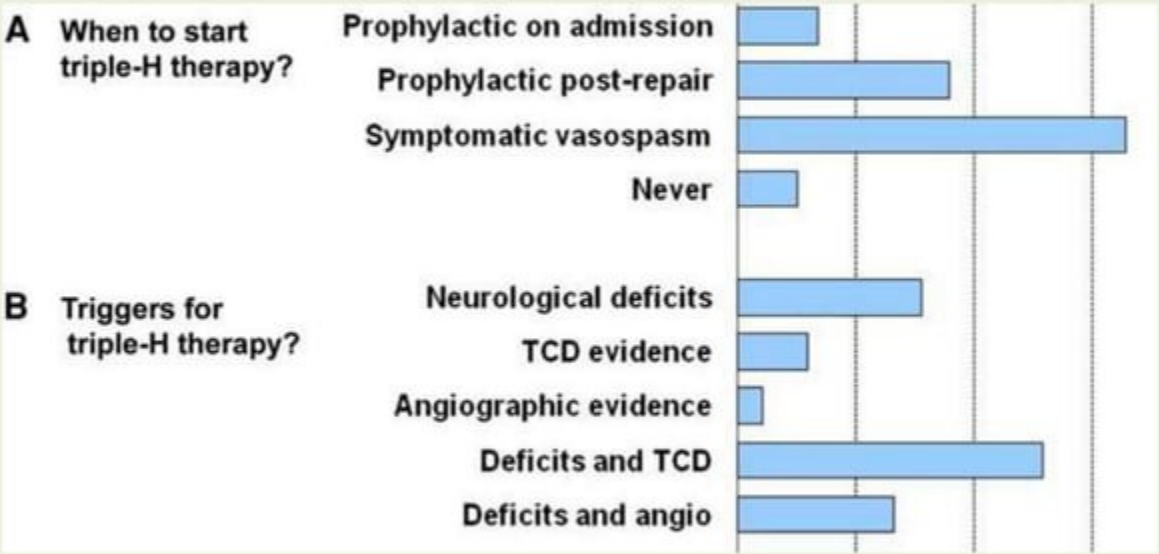
International Survey

- 626 respondants
- Variablity America Vs. Europe
- High volume Vs. Low volume Center



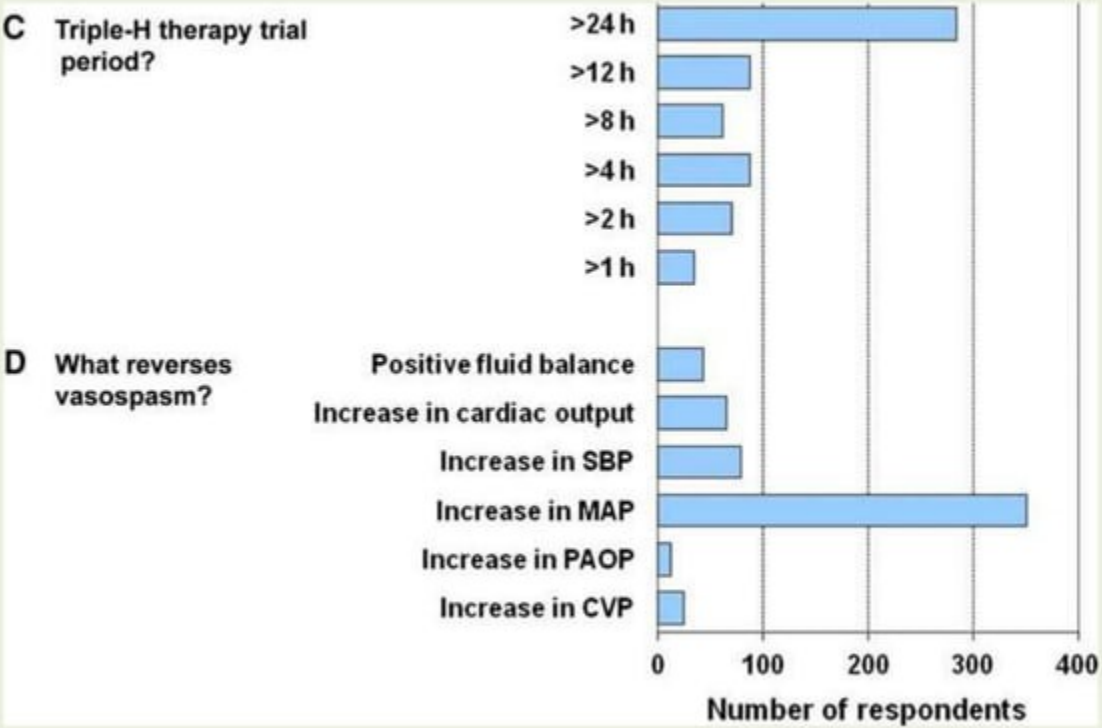
Stevens RD, et al. Intensive Care Medicine 2009.

International Survey



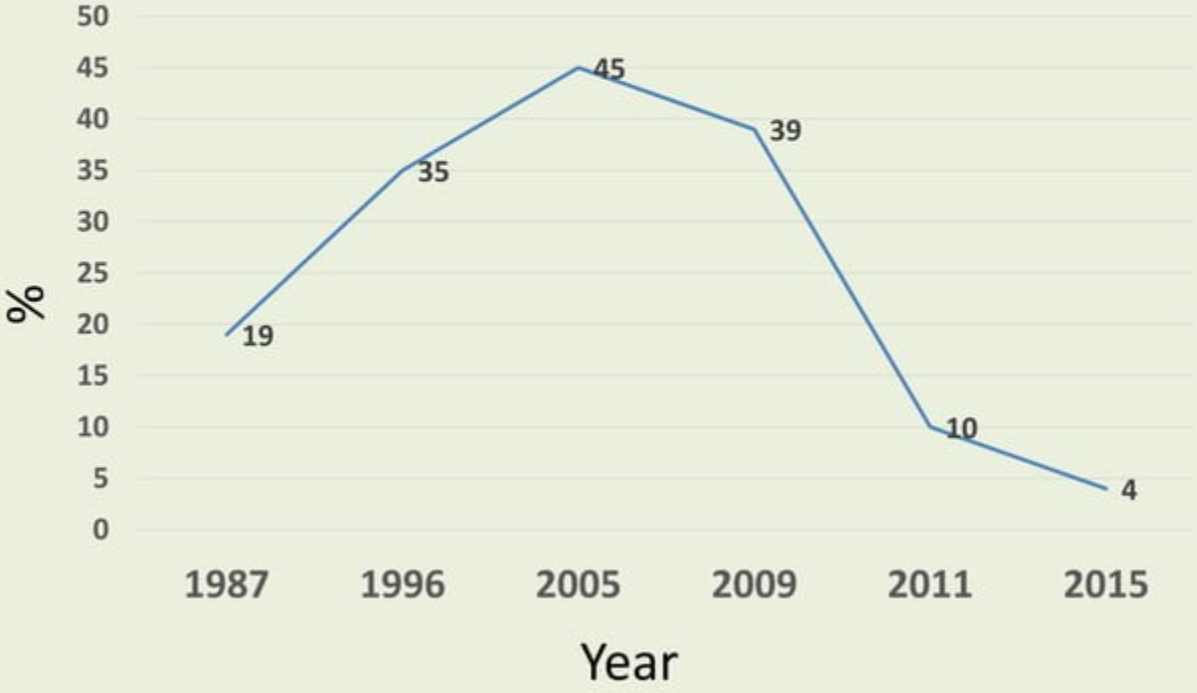
Stevens RD, et al. Intensive Care Medicine 2009.

International Survey



Stevens RD, et al. Intensive Care Medicine 2009.

Survey


50
45
40
35
30
25
20
15
10
5
0
%
19
35
45
39
10
4
1987
1996
2005
2009
2011
2015
Year

Guidelines for 3-H 1994 -2011

- Preventive treatment in 1994 (level of evidence III to V, grade C)
- Reasonable approach in symptomatic vasospasm treatment in 2005 to 2009 (class IIa, level of evidence B)
- Finally abandoned in 2011 (moderate-quality evidence; strong recommendation)
- Increasing evidence of harm (high-quality evidence; strong recommendation)
- Maintain euvolemia, rather than hypervolemia (moderate-quality evidence; strong recommendation)
- Induced hypertension remains a recommendation for the treatment of patients clinically suspected of cerebral vasospasm and cerebral delayed ischemia (CDI) (moderate-quality evidence; strong recommendation)

What we follow in our unit

- Normovolemia
- Normotension
- Early mobilization
- Post op lab including hemoglobin and electorlytes
- CT scan if neurological deterioration
- DCI
  - Normalize blood pressure if low
  - Intraarterial nimodipine

Current Practices of 3-H Prophylaxis and Therapy in Patients with SAH

- No consensus on how to administer therapy
- No agreement on clinical endpoints to guide therapy
- No clear patterns or trends for initiating prophylactic therapy
- Variability in the administration of prophylactic 3-H derives from the lack of evidence and guidelines

Acknowledgement

