

## The origins of the triple-H therapy for subarachnoid hemorrhage and Thoralf M. Sundt Jr

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### Introduction

Dr. Thoralf M. Sundt Jr. was a vascular neurosurgeon at Mayo Clinic who contributed tremendously to our knowledge and understanding of the pathophysiology of subarachnoid hemorrhage (SAH), vasospasm (VSP) and treatment, particularly what is called "Triple H" (HHH- hemodynamic, hemodilution and hypertension) therapy through his life's work and publications. Although early studies of VSP were ongoing before and during Dr. Sundt's career, the origins of who first described this medical treatment remain historically elusive. Herein we describe Dr. Sundt's first description and contributions to our current understanding of clinical vasospasm after SAH and its modern day ICU treatment.

### Methods

We searched Pubmed using key words "triple H", "subarachnoid hemorrhage" and "vasospasm" and later with adding author Thoralf M. Sundt Jr. Individual articles were recalled and refined with regard to their precision to HHH physiology and significance in the management of subarachnoid hemorrhage and vasospasm.

### Results

After selecting using "SAH" and "triple H" search criteria, we discovered 92 publications, with the first using the term "triple H" specifically in 1990 by Origiano et al. Using other search combinations and the author, we found 39 specific publications on the subject. Two articles were eliminated due to discussions based on AV fistulas and AVMs and not SAH. However in 1973, Dr Sundt described using pressors and fluids to increase cerebral blood flow and augment cardiac output in VSP SAH patients in an original article in Mayo Clinic Proceedings and Journal of Neurosurgery. We believe this represents the first physiological and early description of so-called triple H therapy for VSP.

### Conclusions

The term triple H therapy for SAH VSP was originally coined in the 1990 as the concept caught on, but the original physiologic description of this physiologic intervention appears described by Dr Thoralf Sundt in the Mayo Clinic Proceedings and Journal of Neurosurgery. His contributions to our understanding of clinical vasospasm are unparalleled in the field of neurosurgery.

### Learning Objectives

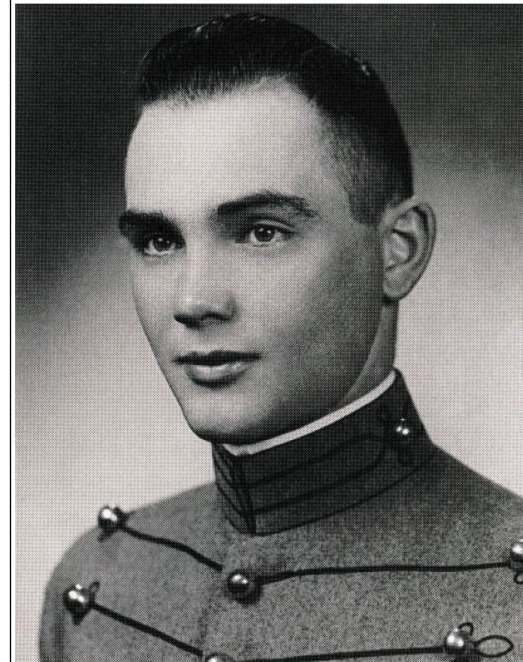
- to discuss Dr. Sundt's contributions to our current understanding of vasospasm and treatment
- to honor the life of Dr. Sundt in the field of neurosurgery

## References

1. Sundt, TM Jr., et al

**Results and complications of surgical management of 809 intracranial aneurysms in 722 cases. Related and unrelated to grade of patient, type of**

Thoralf Sundt Jr



West Point 1948-1952



1930-1992