



Low Grade Subarachnoid Hemorrhage Combined with Routine Vascular Imaging: Predicting Clinical Vasospasm and Shortening Surveillance

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Introduction

Delayed cerebral vasospasm following aneurysmal subarachnoid hemorrhage (SAH) carries significant risk for neurologic injury requiring prolonged hospital stays to monitor and treat those affected. Risk factors include, but are not limited to Fisher grade, Hunt Hess grade, rebleeding, smoking, hypertension, age, WFNS grade and alcohol intake. Most research has focused on identifying those at risk for vasospasm with little literature identifying patients at low risk where prolonged surveillance may be unnecessary. The goal of this study was to determine if low Hunt Hess grade combined with a radiographic survey at 6-8 days would identify those at low risk for vasospasm, potentially allowing early discharge. Although Fisher grade is strongly correlated to vasospam, Hunt Hess grade was chosen as Fisher grade 3 includes the majority of patients, limiting the population for potential discharge, and low Hunt Hess grade also identifies those with the best outcome most likely able to be discharged early.

Methods

A retrospective review from 2004-2013 identified SAH HH I-II patients with vascular imaging completed on SAH day 6-8. Six staff members, four of whom took care of 92% of the patients, treated all patients at a single institution. Demographic, admission, and imaging data were reviewed in addition to the development of angiographic and clinical vasospasm. Patient Characteristics between symptomatic and asymptomatic patients were analyzed using T-tests and Chi-squared methods. Patients were then categorized into respective groups based upon the presence or absence of radiographic and/or clinical vasospasm, and the time period of occurrence. The patient population included both surgical (67%) and endovascular treated patients.

Table 1

Patient Characteristics			
	All Patients	Asymptomatic Patients	Symptomatic Patients
Age	50.8	50.5	54.3
# of Aneurysms	1.44	1.43	1.52
Size of Ruptured (mm)	7.06	7.05	7.14
Admission HH Grade	1.29	1.3	1.21
% Fisher Grade III	55%	54%	63%
% treated surgically	67%	67%	67%
* no significant difference was detected between groups using t-test and chi-squared			

Table 2

Radiographic and Clinical Vasospasm Occurrence in Hunt Hess Grade I and II Patients with Survey Radiographic Imaging for Spasm at Day 6-8		
	n	%
No Radiographic or Clinical Spasm Found	129	44.2%
Radiographic Spasm During or Before Survey and No Clinical Spasm at Any Time	135	46.2%
Radiographic and Clinical Spasm at or before the Survey	22	7.5%
Radiographic spasm at or before the Survey and Clinical Spasm after the Survey	2	0.7%
Clinical Spasm after the Survey without Evidence of Radiographic Spasm on the Survey	0	0.0%
Incidental Radiographic Spasm after the Survey, No Clinical Vasospasm	4	1.4%

Results

292 patients were identified with an admission HH I -II and vascular imaging completed at 6-8 days. The average age was 50.8 years and the average size of the aneurysm was 7.1 mm (Table 1). Vascular imaging included angiography (86%), MRA (10%), and CTA (4%). 44% of patients were found to have neither radiographic nor symptomatic clinical vasospasm (Table 2). Of the 56% having radiographic vasospasm, only 8% developed symptomatic clinical vasospasm. No patient developed clinical vasospasm that had negative vascular imaging at day 6-8. Incidentally, 4 patients (1.4%) showed no vasospasm at day 6-8, but had radiographic spasm on late imaging completed for reasons unrelated to vasospasm; none of these patients developed clinical vasospasm.

Conclusions

In this retrospective review of low-grade SAH patients the incidence of radiographic vasospasm and clinical vasospasm was 56% and 8%, respectively. There was no statistical difference between symptomatic and asymptomatic patients with respect to age, size of aneurysm ruptured, Hunt Hess grade, Fisher grade III percentage, or method of treatment. However, this study was not intended to identify risks for vasospasm, as a low Hunt Hess grade required for inclusion inherently limits the sample size of symptomatic patients and thus limits statistical analysis. Of the symptomatic patients, 91% exhibited clinical vasospasm before 8 days. Although only 1 % of patients developed clinical spasm after day 9, early discharge cannot be advocated as many of these patients were treated at minimum with hypervolemia. No patient developed symptomatic vasospasm after a vascular imaging study completed at post SAH day 6-8 was negative for radiographic vasospasm. This suggests that the duration of monitoring and, potentially, the length hospital stay could be limited in these patients, compromising 44% of the study population.

References

- 1.Bederson JB, Connolly ES, Batjer HH, Dacey RG, Dion JE, Diringer MN, et al. Guidelines for the Management of Aneurysmal Subarachnoid Hemorrhage A Statement for Healthcare Professionals From a Special Writing Group of the Stroke Council, American Heart Association. Stroke. 2009 Mar 1;40(3):994–1025.
- 2.Van Gijn J, Kerr RS, Rinkel GJE. Subarachnoid haemorrhage. Lancet. 2007 Jan 27;369(9558):306–18.
- 3.Gijn J van, Rinkel GJE. Subarachnoid haemorrhage: diagnosis, causes and management. Brain. 2001 Feb 1;124(2):249–78.
- 4.Hijdra A, Vermeulen M, van Gijn J, van Crevel H. Rerupture of intracranial aneurysms: a clinicoanatomic study. J Neurosurg. 1987 Jul;67(1):29–33.
- 5.Nakae R, Yokota H, Yoshida D, Teramoto A. Transcranial Doppler Ultrasonography for Diagnosis of Cerebral Vasospasm After Aneurysmal Subarachnoid Hemorrhage: Mean Blood Flow Velocity Ratio of the Ipsilateral and Contralateral Middle Cerebral Arteries: Neurosurgery. 2011 Oct;69(4):876–83.
- 6.Longstreth WT, Nelson LM, Koepsell TD, van Belle G. Clinical course of spontaneous subarachnoid hemorrhage: a population-based study in King County, Washington. Neurology. 1993 Apr;43(4):712–8.
- 7.Rabinstein AA, Friedman JA, Weigand SD, McClelland RL, Fulgham JR, Manno EM, et al. Predictors of cerebral infarction in aneurysmal subarachnoid hemorrhage. Stroke. 2004 Aug;35(8):1862–6.