Institution of a Pharmacologic Prophylaxis Protocol is Correlated with a Reduction in Symptomatic Cerebral Vasospasm Following Aneurysmal Subarachnoid Hemorrhage

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Introduction

In June 2007, the Division of Neurosurgery at UVM initiated institutional guidelines requiring vasospasm prophylaxis with magnesium and statins, in addition to the existing practice of nimodipine dosing for all patients following aneurysmal subarachnoid hemorrhage. This retrospective study aims to analyze the effect of protocol initiation on medication dosing and the effect of protocol compliance on the prevalence of symptomatic cerebral vasospasm in this population.

Figure 1: Patient Characteristics

Characteristic	Pre-Prophylaxis	Post Prophylaxis	P
n	99	67	-
Demographics			
Age	54.5	53.5	0.64[a]
Women (%)	63.6	67.1	0.76
Clinical Characteristics			
Hunt and Hess	2.7	2.4	0.39[a]
Radiographic Characteristics			
Modified Fisher Score	2.8	2.6	0.14[a]
Anterior Circulation Aneurysm (%)	64.4	72.7	0.31
Treatment Factors			
Ventricular Drain Placed (%)	58.5	36.3	**0.006**
Endovascular Treatment (%)	35.3[d]	43.9[b]	0.25
Clip Ligation (%)	64.6[c]	63.6[b]	1
Outcome Features			
In Hospital Mortality (%)	14.1	5.9	0.12

[a] ANOVA; all other statistics Fisher's Exact; [b] includes six patients failed endovascular treatment and went on to have open clip ligation of aneurysms; [c] includes one patient who had aneurysm wrapped; [d] includes one patient who had aneurysm embolized

Methods

All patients admitted between January 2000 and March 2011 with angiographically confirmed aneurysmal subarachnoid hemorrhage were included in this study (n=205). Exclusion criteria included survival for less than three days after ictus and presentation more than 14 or more days after onset of symptoms. Following application of exclusion criteria, the patient cohort was sorted into two groups based on presentation before (n=99) or after (n=67) initiation of institutional prophylaxis guidelines. Symptomatic cerebral vasospasm (SCV) has been defined by neurologic change in conjunction with radiographic evidence of vessel spasm (TCD>120cm/s or angiography).

Figure 2: Protocol Compliance

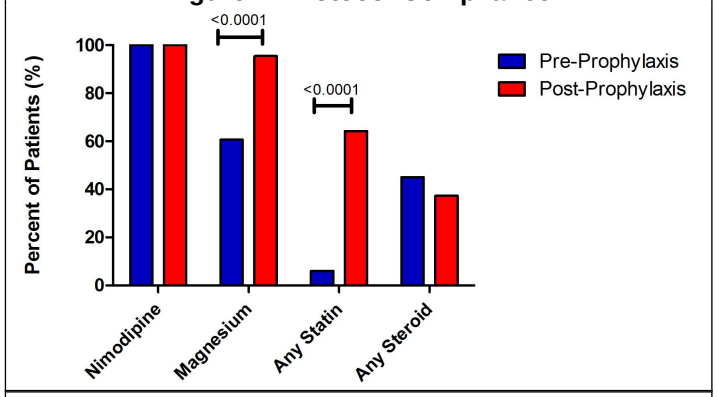
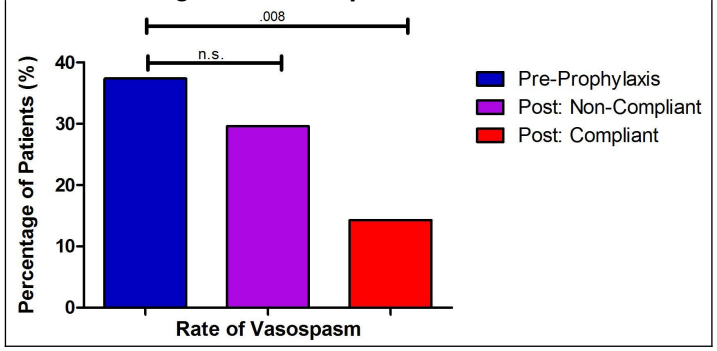


Figure 3: Vasospasm Prevalence



Results

Pre- and post-protocol groups were similar in all demographic and treatment characteristics with the exception of a significantly higher rate of EVD placement in the pre-protocol cohort **(Figure 1)**. The post-protocol group was significantly more likely to receive magnesium and a statin in comparison to the pre-protocol group **(Figure 2)**. The overall compliance rate was 62.8%. Presence of SCV was found to be significantly more common in the pre-protocol group when compared to the post-protocol group (p=.009, data not shown). When further separating groups by protocol compliance, the post-protocol compliant group had a significantly lower rate of SCV than the pre-protocol group when compared to the non compliant group **(Figure 3)**.

Conclusions

During its four active years, this prophylaxis protocol increased the administration of prophylactic medications from 2% in the pre-protocol group to 62% in the post-protocol group. Compliance with the protocol did not increase with time, rather it increased in years when there were more patients presenting with aSAH **(Figure 4)**. This would suggest that compliance is correlated with provider knowledge of and comfort with the protocol. Methods to increase protocol compliance may therefore include yearly patient management refreshers or an automatic protocol associated with SAH admission in an EMR.

Data presented here has also suggested that compliance with a vasospasm prophylaxis protocol may be correlated with a decrease in the prevalence of SCV in a population of patients with aneurysmal subarachnoid hemorrhage. Statins and magnesium have been individually studied as prophylactic medications with varied results but have never been observed as combined therapy. A retrospective chart review is not grounds on which to alter current clinical practice, but can serve as a baseline for a prospective randomized controlled trial assessing for added efficacy as combined therapy.

Figure 4: Compliance Rates