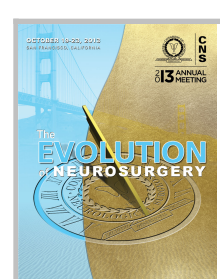


# Predictors of Multiple Aneurysms in Patients with Subarachnoid Hemorrhage

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## Introduction

Intracranial aneurysms are a major cause of subarachnoid hemorrhage (SAH) and hemorrhagic stroke. Many patients have greater than one aneurysm on presentation, but the exact genetic or environmental factors that predispose a patient towards the development of multiple aneurysm are unclear. We sought to assess the factors predisposing a patient towards multiple aneurysms among patients presenting with subarachnoid hemorrhage.

## Methods

Patients presenting to the Columbia University Medical Center Neurological ICU were prospectively enrolled from 1996-2012. Patients with an aneurysm confirmed by angiography that appeared to be the source of the hemorrhage were assessed for clinical and radiographic characteristics that were associated ( $p < 0.2$ ) with one, two, or three or more aneurysms using univariate comparisons (Chi-squared, Mann-Whitney, and Student t-test). Multiple logistic regressions were performed on associated factors.

## Results

Of 1277 patients, 890 had one aneurysm, 267 had two aneurysms, and 120 had three or greater aneurysms. Amongst those presenting with SAH, factors associated with a single aneurysm were male gender (OR 1.78;  $p = 0.0276$ ), lower BMI (OR 0.976;  $p = 0.0062$ ). Patients of black ethnicity were less likely to present with a single aneurysm (OR 0.438;  $p = 0.0012$ ). Smoking alone predisposed patients to two aneurysms (OR 1.018/pack-year;  $p = 0.423$ ). In contrast, anti-platelet use was found to be protective (OR 0.342;  $p = 0.0399$ ). Black ethnicity (OR 2.803;  $p = 0.0003$ ), history of polycystic kidney disease (OR 5.534;  $p = 0.038$ ), and higher BMI (OR 1.023;  $p = 0.0187$ ) were found to be predictive of patients present with three or more aneurysms.

## Conclusions

Patients presenting with SAH and multiple aneurysms can be readily stratified by unique risk factors. Patients with two aneurysms appear to represent a group who is predisposed by environmental factors, whereas patients with three or more aneurysms appear to be predisposed predominantly by genetic factors. However, gender and BMI appear to play a role in all multiple aneurysms.

## Learning Objectives

- 1) To understand the differential role that genetics and environment may play in aneurysm development.
- 2) To recognize that genetic predispositions may play a greater role in those with greater than 2 aneurysms
- 3) To understand that the development of one or two aneurysms may be more secondary to environmental factors.

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