Annual Meeting of the AANS/CNS Cerebrovascular Section
Held in conjunction with the 4th SNIS International Endovascular Stroke Conference (IESC)
February 10-11, 2014
Hard Rock Hotel
San Diego, CA

Race/Ethnicity and Other Risk Factors Associated with Hemorrhagic Presentation of Intracranial Arteriovenous Malformations

Wuyang Yang; Justin M. Caplan MD; Xiaobu Ye; Joanna Wang; Maria Braileanu; Geoffrey P. Colby MD PhD; Alexander Lewis Coon MD; Rafael J. Tamargo MD; Judy Huang MD
Department of Neurosurgery, Johns Hopkins University School of Medicine

Introduction

Longitudinal studies describing the incidence of hemorrhage in untreated arteriovenous malformations (AVMs) demonstrate factors associated with increased hemorrhage risk, including both angiographic and clinical characteristics. However, these studies include an inherent bias by the selection of AVMs deemed most appropriate for conservative management. Alternatively, studies focusing on hemorrhagic presentation of AVMs aim to avoid this bias, but have largely limited their analysis to descriptions of angiographic features. We report the importance of race/ethnicity as a new clinical predictor of AVM hemorrhagic presentation in addition to previously reported angiographic features.

Methods

We prospectively and retrospectively collected patients(n=194) from 1993-2010, who had a single intracranial AVM and compared baseline characteristics for hemorrhagic presentation vs. non-hemorrhagic presentation using t-test/Wilcoxon rank sum test or chi-square. Univariate analysis was performed on 19 clinical and angiographic variables. Features that were statistically or clinically significant were included in a multivariate analysis.

Results

The median age was 32 years(0-74), with 37.2% male. Spetzler-Martin grades were: I(17.5%), II(37.1%), III(28.9%), IV(14.9%), and V(1.5%). Significant baseline characteristics between hemorrhage vs. non-hemorrhagic presentation groups were: race(p=.0009), AVM size(p<.0001), <3 feeding arteries(p=0.0139), absence of MCA feeding artery(p=.0045) and AVM location(p=.0067). Univariate analysis revealed age, race, AVM size, MCA feeding artery, feeding artery number, Spetzler-Martin grade and AVM location as statistically significant. Multivariate analysis revealed non-white race(OR=3.09[1.52-6.44],p=.0021), smaller AVM size(OR=0.65[0.19-0.86],p=.0036) and non-frontal lobar (OR=2.61[1.2-5.59],p=.0171), basal ganglia(OR=6.20[1.52-26.26],p=.0114) or brainstem locations(OR=4.41[1.38-14.92],p=.0139) as risk factors for hemorrhagic presentation.

Conclusions

Studies of AVM natural history have demonstrated angiographic features and race/ethnicity as increasing hemorrhagic risk, but impose a selection bias for untreated AVMs. In this study, we confirmed previous observations that AVM size and location are associated with hemorrhagic presentation. To our knowledge, this is the first study that demonstrates the clinical variable of race/ethnicity as a risk factor for hemorrhagic presentation.