CNS 2018 ANNUAL MEETING
HOUSTON, TEXAS
OCTOBER 6-10, 2018

# Arteriovenous Malformations with Associated Aneurysms: Treatment Strategies and Outcomes

Amit Pujari BSE; Jason J. Lamanna PhD; James G Malcolm MD, PhD; Vijay Agarwal MD; Daniel Louis Barrow MD
Emory University School of Medicine, Department of Neurosurgery

EMORY UNIVERSITY SCHOOL OF MEDICINE

## Introduction

Arteriovenous malformations (AVMs) are abnormal formations of blood vessels that connect arteries and veins causing blood to bypass surrounding tissue. AVMs can be complicated by the presence of an associated aneurysm. The effects on outcomes and management of these aneurysms are not well established, but are thought to likely depend on aneurysm location relative to the AVM.

## Methods

A retrospective study was conducted for patients who were diagnosed with an arteriovenous malformation at Emory University Hospital between October 2013 and October 2017. Factors examined included presentation as hemorrhage, Spetzler Martin (SM) grade, the presence of associated aneurysm, Redekop classification of associated aneurysm, treatment modality, and functional outcome at last follow up.

## Results

A total of 152 patients were included (77 male, 75 female, age 46 +/- 16 years). Ninety-two (61%) presented with hemorrhage. Average Spetzler Martin grade was 2.5 +/- 1.1. Sixty-six patients (43%) presented with associated aneurysms, and of these 24 (36%) had at least 1 intranidal (Redekop class 1) aneurysm, 43 (65%) had flow-related (class 2a or 2b) aneurysms, and 13 (20%) had aneurysms unrelated to their AVM (class 3).

Thirty-eight patients (25%) were observed, 37 (24%) underwent stereotactic radiosurgery alone or with embolization, and 71 (47%) underwent craniotomy with/without preop embolization or adjuvant radiosurgery. Modified Rankin score (mRS) was best for SM2 (1.0) while SM5 had the worst mRS (3.0).

Fourteen untreated aneurysms in 6 patients had follow-up imaging of their associated aneurysms after AVM treatment. Twelve remained stable and 2 (in same patient) regressed in size. Both aneurysms that regressed were proximally flow-related (class 2a) while an unrelated aneurysm in the same patient did not

## Discussion and Conclusions

The prevalence of AVM-associated aneurysms in our series was 43%, significantly larger than the 10-20% seen in other large case series. AVMs with associated aneurysms present a technical challenge and require multi-modal treatment. AVM treatment does not seem to affect extranidal aneurysms. Flow-related aneurysms behave similarly to unrelated aneurysms and should be evaluated independently for treatment.

## References

Flores, et al., Neurosurg Focus, 2014
Redekop, et al., J. Neurosurg, 1998

## Results (Cont.)

Sixty percent of patients with flow-related aneurysms (Redekop class 2) presented with rupture of the AVM or aneurysm, as compared to 63% of patients with unrelated aneurysms (Redekop class 3) and 79% with intranidal aneurysms (Redekop class 1). Twenty-three percent of class 2 patients re-hemorrhaged after initial presentation, as compared to 25% of class 3 patients and 14% of class 1 patients.