

# Hemodynamic Characteristics Associated with Cerebral Aneurysm Formation in Patients with Carotid Occlusion.

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### Introduction

The pathogenesis of cerebral aneurysms in patients with internal carotid artery (ICA) occlusion is poorly understood. We examined the hemodynamic characteristics associated with aneurysm formation in patients with ICA occlusion.

### Methods

Patients with unilateral internal carotid artery stenosis/occlusion = 90% who underwent hemodynamic assessment before treatment using quantitative magnetic resonance angiography were retrospectively reviewed. Patients were classified into two groups based on presence or absence of aneurysms. Hemodynamic parameters – flow volume rate, flow velocity, wall shear stress (WSS) – were measured in each vessel supplying collateral flow – bilateral A1 segments and bilateral posterior communicating arteries – and then compared between the two groups using the independent 2tailed Student's t test.



Contralateral A1 hemodynamics in patients with and without aneurysms.

#### Results

36 patients were included (8 with and 28 without aneurysms). Mean flow (72.3 vs. 48.9 mL/min, P=0.10), flow velocity (21.1 vs. 12.7 cm/s, P=0.006), and WSS (22.0 vs. 12.3 dynes/cm2, P=0.003) were each higher in the A1 segment contralateral to the side of ICA stenosis/occlusion in patients with versus without aneurysms (Figure). Among patients with aneurysms, the vessel with the highest flow, flow velocity, and WSS tended to correspond to the location of the aneurysm.

# Conclusions

Flow velocity and WSS are significantly higher across the anterior communicating artery in patients who harbor an aneurysm and the aneurysm is often located at the anterior communicating artery. Thus, robust primary collaterals after ICA occlusion can lead to cerebral aneurysm formation.

## Learning Objectives

By the conclusion of this session, participants should be able to:

1) Understand the pathogenesis of cerebral aneurysms in patients with carotid occlusion

2) Identify patients at risk for aneurysm formation

3) State the location where aneurysms are likely to form in the setting of carotid occlusion