
# Hemodynamic Changes within the Dome of Human Cerebral Aneurysms in Response to Artificially-Induced Increases in Systemic Blood Pressure

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## Introduction

The formation and rupture of cerebral aneurysms have been associated with hypertension and inflammation. The effect of transient increases in systemic systolic blood pressure (SBP) and its correlation with intra-aneurysmal hemodynamic parameters have not been studied before. This study investigates in vivo the effects of transient elevations in systemic SBP on different hemodynamic parameters inside the aneurysm sac and parent arteries using invasive technology.

## Methods

Nine patients with unruptured cerebral aneurysms undergoing coiling were recruited. Dual sensor microwires (0.4mm diameter) with the capacity to simultaneously measure flow velocity and pressure were used to measure systolic, diastolic and mean pressure inside the aneurysm sac. Microwires provided measurement of pressures and peak/mean flow velocities in the parent vessel. The measurements were obtained at baseline and after transient (<10 minutes) incremental increases in systemic SBP up to 25 mm Hg above baseline with a phenylephrine infusion. Systemic hemodynamic parameters (radial arterial catheter) were correlated to intra-aneurysmal and parent arteries parameters.

## Results

Eight females and one male with anterior circulation aneurysms were enrolled. The average maximal dose of phenylephrine needed to achieve the required increase in systemic SBP was 0.8 ug/kg/min (range 0.5-1.0). Three patterns emerged when comparing intra-aneurysmal hemodynamics to changes in systemic hemodynamic parameters: 1) patients with significantly higher increases in aneurysmal compared with systemic pressures; 2) patients with similar variations in aneurysmal and systemic pressures; 3) patients with significantly lower increases in aneurysmal compared with systemic pressures. Peak and mean flow velocities in the parent arteries did not change significantly with phenylephrine infusion, nor did vessel diameters as measured angiographically.

## Conclusions

This study correlates transient changes in systemic hemodynamic stress to changes in intra-aneurysmal hemodynamics and may help identify patient subgroups predisposed to aneurysm rupture during transient changes in SBP. This may provide additional insight into the mechanism of aneurysm rupture.

## Learning Objectives

To understand the relationship between systemic blood pressure changes and corresponding intra-aneurysmal changes.

## References

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