



Breaking the Patient-Specific Barrier: Creating Models to Improve CFD for Aneurysm Treatment

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Background

- Aneurysm: weakening and dilation of arterial wall
 - Intracranial
 - Subarachnoid Hemorrhage: mortality, disability, high health care costs
- Treatment: coils or stents
 - Outcome varies \rightarrow grow, return or rupture
- Predictor: Changes in aneurysm hemodynamics



http://www.joeniekrofoundation.com/treatment/endovascular-embolization-coiling/

What tool do we use?

- Small size: difficult to study hemodynamics
- CFD: Computational Fluid Dynamics
 - Advantages: Cost & time effective
 - Output: Blood flow pattern
 - Input: Vasculature & treatment device
- Treatment device too small
 - Current: Homogenous porous medium
 - "Gold Standard": Synchrotron x-ray microtomography



1 mm

How do we get information about the treatment devices?

- Create life-size silicone models
 - Technological advancements: 3D printing
- Advantages
 - Verify validity of CFD
 - Hollow model allows flow experiments
 - Assist in surgical planning
 - Past studies: Used bigger models



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Synchrotron scans (over

Segmented fro







-vitro phantom



Breaking the Patient-Specific Barrier: Improving Treatment Efficacy

- Goal: Identify and quantify limitations with current CFD model (porous medium) and develop corrective factors to improve accuracy
 - Clinically-relevant timeframe
 - Aid in surgical planning



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