**MODELING THE EFFECT OF HEMODYNAMICS ON ENDOTHELIAL RNA EXPRESSION IN CEREBRAL ANEURYSMS AFTER ENDOVASCULAR FLOW DIVERSION**

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**Abstract**

Flow diverting stents (FDS) are a valuable endovascular option to treat unruptured cerebral aneurysms, with a single endoluminal device in the parent vessel ultimately promoting thrombosis and occlusion of the aneurysm sac. Flow diversion has yielded promising long-term aneurysm occlusion data; however, retreatment is required in up to 8% by 2 years. Questions remain about the biologic responses behind treatment successes and failures. The goal of this study is to understand how changes in hemodynamic flow after FDS placement affect aneurysmal endothelial RNA expression associated with treatment success or failure.

**Methods**

An in vitro, patient-specific three-dimensional aneurysm model with pre- and post-FDS treatment conditions was created to quantify the endothelial response specific to hemodynamic changes within the aneurysm dome seen on computational flow dynamic (CFD) simulations. Each model was seeded with human carotid endothelial cells and then subjected to pulsatile flow with patient-specific mean blood flow velocity for 24 hours (Figure 1). RNA was isolated from aneurysm dome, along with proximal and distal parent vessels serving as internal controls for each patient. The same experiments are performed both before and after FDS placement using commercially available FDS (Pipeline Embolization Device).

**Results**

Six unique patients with intracranial internal carotid artery aneurysms treated with FDS were included, of which three had successful treatments with complete occlusion, while three had treatment failure with persistent aneurysm filling requiring retreatment. Experiments are currently ongoing, with four of six pre-treatment models completed endothelial cell seeding, exposure to flow, and RNA isolation. Post-treatment models with implanted FDS will then undergo the same experiment. We then will use the colocated CFD and RNA expression data to identify patterns consistent with treatment outcomes. Bulk RNA sequencing will be completed on each sample.

**Conclusions**

Direct study of the vascular endothelial response to changes in hemodynamic stress experienced in cerebral aneurysms after FDS has not yet been performed. This study could address the knowledge gap regarding the mechanisms of treatment outcome and angiographic occlusion, to ultimately improve endovascular treatments of cerebral aneurysms.

**Disclosures**

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**TRANSUMBILICAL ACCESS FOR VEIN OF GALEN MALFORMATION AND DURAL/PIAL ARTERIOVENOUS FISTULA EMBOLIZATION: A REVIEW OF LITERATURE**

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**Abstract**

Vein of Galen Malformations (VOGM), in infants, presents with congestive heart failure, macrocephaly, failure to thrive, developmental delays, or other serious neurological impairment. Trans-arterial embolization (TAE) has markedly improved since the inception of endovascular therapy and commonly utilizes the transfemoral approach. In the neonatal period, transfemoral access may be complicated by the endovascular sheath size (typically 4F) needed to perform embolization therapy, especially if retreatment is required. Our practice, between January of 2014 and September of 2021 has utilized the trans-arterial, trans-umbilical embolization approach for VOGM, dural AVF, and pial AVF, but a lack of reporting in the literature demonstrates a need for a review.

**Methods**

We performed a literature review by parameterizing a search on PubMed with the terms, ‘umbilical’ and either ‘Vein of Galen,’ ‘pial AVF,’ or ‘dural AVF.’ The five articles chosen for detailed review described the use of trans-umbilical, cerebral angiography or endovascular embolization of VOGM, dural AVF, or pial AVF.

**Results**

The initial results of the PubMed query provided 12 articles with no duplicates, seven of which were removed due to focus on diagnosis rather than intervention. The five articles selected for detailed review range widely over the span of 19 years (1997–2016). Berenstein et al. originally presented the trans-umbilical technique in 1997 as a means to ameliorate high output cardiac failure, preserve the femoral arteries for future treatments, and effectively de-vascularize the VOGM with no reported complications. Two years later, Komiyama et al. reported a similar use of the trans-umbilical technique to treat a dural AVF at the torcula of a