# AbstractID: 10409 Title: Rapid prototyping of vascular trees for quality assurance of dynamic contrast enhanced perfusion imaging and analysis

**Purpose:** The increasing need for a quantitative imaging validation tool is fueled by the propagation of perfusion imaging for cancer treatment, prognosis and evaluation. Current methods of providing validation for dynamic contrast-enhanced (DCE) imaging and analyses have been limited to simulated data, which do not account for variances in image acquisition and artifacts, and static phantoms, which do not yet monitor dynamic effects and their analyses. This work investigates Rapid Prototyping (RP) techniques as a means of creating a high-order branched vascular phantom amenable to modular integration of regions with differential perfusion. **Method and Materials:** Three dimensional computerized vascular trees were generated. Each successive bifurcation produced vessels with a smaller inner diameter. The tree structure was fabricated using two RP methods: Selective Laser Sintering (SLS) and Fused Deposition Modeling (FDM) using polycaprolactone (PCL) and ABSplus, respectively. Tests of the phantoms included evaluation of occlusion for the smaller diameter vessels, as well as DCE CT for end-to-end testing with perfusion analysis software. **Results:** Three orders of branching were produced. The build accuracy of the phantoms were assessed with physical measurements and determined to be approximately +/- 200 microns. Vessels with inner diameters of 900 microns were successfully created. DCE CT demonstrated usable flow data across the increasing levels of bifurcation. **Conclusion:** RP has been successfully tested as a means to generate vascular networks in association with construction of a perfusion phantom for quality assurance of DCE imaging and analysis. Current efforts include development of modular elements for generation of the capillary-tissue interface. Supported by NIH P01-CA59827 and the Gates Foundation.