AbstractID: 6598 Title: Patient specific angiography phantoms for investigating new endovascular image-guided interventional (EIGI) devices

Purpose: To provide patient-specific phantoms for investigating new endovascular image-guided interventional (EIGI) devices such as stents.

Methods and Materials: A human cerebral/saccular aneurysm phantom was constructed from a patient's segmented CT-scan data. The CT-derived vascular lumen was converted to a standard stereolithography (STL) computer file which was used, through a rapid-prototyping process, to make a plastic resin (Accura 25) mold of the vessel with the aneurysm. In this process, an ultraviolet laser is used to selectively cure a liquid plastic layer by layer resulting in a highly accurate and very detailed positive model. RTV silicone is placed around this plastic aneurysm, allowed to cure, and then cut in half to create a mold with a cavity in the shape of the aneurysm. This mold is used to make a wax replica of the human aneurysm. The wax replica is then immersed in a silicone elastomer solution, the bubbles removed via vacuum, and the elastomer allowed to cure. The wax is then dissolved using boiling water.

Results: The finished product is a clear elastomer model with a patient-specific aneurysm cavity that may be used in both x-ray and optical flow experiments. Multiple identical elastomer phantoms can be generated from one mold so that new EIGI devices such as an asymmetric stent with a low porosity patch region to occlude aneurysmal flow can be variously deployed under fluoroscopic guidance and evaluated angiographically. Additionally, the effects of contrast media can be studied by comparisons with optical flow studies. Comparisons of angiographic and optical time-density curves for an anterior cerebral artery with multi-lobular aneurysm will be presented.

Conclusions: We have developed a unique system for the creation of realistic patient-specific phantoms which enable the evaluation of detailed vascular flow and experimental EIGI treatment techniques for clinically representative pathology.

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