

AbstractID: 6572 Title: Regional time density curves (R-TDC) derived from angiographic sequences for analysis of aneurysmal flow modification resulting from endovascular image-guided interventions

Purpose: Digital subtraction angiography (DSA) is currently used to evaluate the result of endovascular treatments, either visually or using time-density curves (TDC) which quantitate the change of contrast as a function of time for the entire aneurysm. Regional analysis (R-TDCs) of flow patterns in sub-volumes of an aneurysm was employed in this study to extract local flow information to determine the result of treatment with a partially-occluding asymmetric vascular stent (AVS).

Method and Materials: A patient-specific, elastomer aneurysm phantom was placed in an in-vitro pulsatile flow loop containing a glycerin-water (25/75) solution simulating blood. One cc volumes of iodinated contrast were delivered 20 cm from the aneurysm entrance through a 6-Fr catheter with an automatic injector. DSA sequences were acquired at 30 frames/sec using a 5-inch II mode. The neck of the aneurysm was partially covered by a polyurethane-patch AVS positioned to occlude either the proximal or the distal portion of the orifice. R-TDCs were obtained for untreated and treated cases.

Results: Differences in R-TDC parameters for untreated, proximally covered, and distally covered cases indicate important modifications of flow occurred in different areas inside the aneurysm that are not evident from the total volume TDC. For example, in one sub-region with the proximal patch, we measured a 2.3 times increase in peak density compared to the untreated case and a residence time 3.9 times longer, whereas the total aneurysm measurement showed the peak density to be reduced to 0.8 times and the residence time to be increased by a factor of only 1.9 compared to the untreated case.

Conclusion: R-TDC parameters derived from angiographic sequences present a great potential for quantitative in-vivo assessment of local hemodynamic effects. This approach may provide a valuable, minimally invasive tool for assessing endovascular treatments during the procedure.

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