AbstractID: 9126 Title: Vascular occlusion by acoustically vaporized droplets for potential targeted enhancement of thermal therapies

Purpose:
Acoustic droplet vaporization (ADV) of perfluorocarbon droplets with boiling points below ambient temperature shows promise for spatially and temporally targeted vascular occlusion. Vascular occlusion of a tumor or other target tissue can decrease the local heat dissipation relative to adjacent normal tissues during less directed or slow thermal therapies, such as RF or ultrasonic ablation. Also, encapsulated drugs can be released with the occluding bubbles into the target tissues.

Method and Materials:
In six canines, *in vivo* gray scale imaging and color flow and pulse wave (PW) Doppler imaging were employed with low concentration droplet injections to identify exteriorized target arteries or tissues, avoiding major adjacent veins. Short tone bursts at 3.5 MHz with 0.25% duty cycle were used during bolus passage to vaporize droplets with concentrations comparable to clinical ultrasound contrast agent recommendations. Studies included multiple intracardiac (IC) and intravenous (IV) injections, the latter with lipid, rather than albumin, shell.

Results:
Bubble production by ADV in arteries or tissues is easily visible in gray scale images. Both IC and IV injections repeatedly produced ADV at will in the renal or segmental artery, each injection and ADV generating vascular occlusion as seen by gray scale and Doppler imaging. Mean cortex occlusion was ~85% by colored microspheres in the targeted kidney or renal pole with an ~10 min half life per droplet dose. Cardiopulmonary symptoms occurred in some IC injections. ADV was successful in a canine prostate using an intercavitary imaging array for ADV and targeting.

Conclusion:
Keys to the new, consistent success with both IC and IV injections include adequate concentrations of droplets, use of frequencies with ADV threshold well below those for cavitation, and reliable targeting.

Of Interest:
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