AbstractID: 5196 Title: Radiofrequency Ablation Electrode Displacement Elastography

Purpose: Elastography can be used to image the position and location of thermal lesions created using radiofrequency (RF) ablation. A challenge, however, when applying this technique to guide treatment of liver tumors is that of producing a controlled compression of the tissue. We are testing a new method, 'electrode displacement elastography', for producing elasticity images of ablation therapy treatments. This paper presents results of tests in a custom elastography phantom.

Method and Materials: An elastography phantom containing a stiff inclusion (50 kPa) embedded in a soft (11kPa) background was used. A discarded RF electrode was mounted firmly into the inclusion with the handle extending outside the phantom container. A stepper motor applied small (0.1mm) displacements while the phantom was imaged using an ultrasound machine equipped with a research interface, acquiring raw echo data before and after small perturbations of the electrode. One-dimensional cross correlation was used to estimate displacements. Finite element analyses were also performed to characterize the contrast-transfer efficiency (CTE) of the conversion from the underlying modulus domain to the observed strain domain.

Results: On elastograms the inclusion has a characteristic halo appearance, similar to that observed in *in-vivo* tests of this technique. Strain contrast is consistently higher than the underlying modulus contrast, confirmed by a study of the CTE. On simulated strain images, stiffer inclusions in softer backgrounds have CTE values in excess of 0 dB.

Conclusions: Feasibility of electrode displacement elastography is shown. The strain contrast observed exceeds the underlying modulus contrast, for stiffer inclusions. This characteristic of the method may provide RF ablation practitioners with added lesion contrast in situations where the actual stiffness ratio between the lesion and surrounding normal tissue is not significantly greater than 1:1.

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