AbstractID: 2940 Title: Techniques to Monitor Transgenic Mouse Models of Prostate Cancer Using Ultrasound Micro-Imaging

Purpose: The usefulness of three-dimensional (3D) high-frequency ultrasound as a tool to monitor tumor progression in a genetically engineered mouse model of prostate cancer was investigated.

Method and Materials: A genetically engineered mouse model (PSP94 gene-directed transgenic mouse adenocarcinoma of the prostate) was used that spontaneously developed prostate tumors. Mice were imaged with a commercial high-frequency ultrasound system including 3D imaging, power Doppler, and 3D power Doppler capabilities. Primary and metastatic tumor detection was confirmed by gross pathology and histology. Primary tumors were imaged longitudinally to monitor growth. Power Doppler was used to investigate blood vessel formation within tumors.

Results: Primary tumors could be detected while still small (under 2.5 mm in diameter) and imaged repeatedly as they grew. Tumors were manually segmented in 3D images to measure volumes. Exponential growth curves fit the measured tumor volumes well (r^2=0.939 to 0.986) even though the estimated growth rate constants (0.054 to 0.143 days^{-1}) were markedly different. Examples of metastatic tumors were also detected, including a liver and a lymph node metastasis.
Initial 3D power Doppler reconstructions showed intratumor vessels approximately 150 μm in diameter.

Conclusion: High-frequency ultrasound can be used for longitudinal studies of volume and vasculature development of prostate tumors in genetically engineered mice. Ultrasound is a promising technique for assessing treatment responses in preclinical trials of prostate cancer therapies.

Conflict of Interest (only if applicable):
VisualSonics, the manufacturer of the ultrasound system, has licensed 3D reconstruction, visualization, and segmentation software from our laboratory.