

AbstractID: 7088 Title: Anthropomorphic Uterus Phantoms for Testing Elastography Systems

Purpose: To develop uterine phantoms for mimicking in vivo ultrasound strain imaging in saline infused sonohysterography (SIS) and employ them to compare strain imaging (elastography) systems.

Method and Materials: Dimensions and shapes of the two phantoms simulate the uterus of a pre-menopausal woman with no previous pregnancy. Phantoms were constructed using tissue-mimicking (TM) materials consisting of dispersions of safflower oil in gelatin. 10%, 70% and 80%, oil dispersions represent fibroids, endometrial polyps, and fat, respectively. Myometrium and cervical tissues were represented by 40% in one phantom and 50% in the other. In the first uterine phantom, 3-mm diameter TM fibroids were randomly distributed in TM myometrium. The second uterine phantom has a 10-mm fibroid on the serosal surface and 5-mm and 8-mm spherical fibroids and 5-mm spherical and 8-mm x 5-mm peg shaped endometrial polyps protruding into the endometrial cavity. Samples for determining physical properties were made at the time of phantom production. RF data was acquired during a volume expansion of the endometrial cavity using the Siemens Antares VFX 13-5 and 9-4 transducers at 11 and 9 MHz, respectively, on the Aloka SSD 2000 at 7.5 MHz, and on a third system at 4 MHz. Strain images were generated using a 2-D block matching or a 2-D multilevel strain estimation technique.

Results: Strain images from the first phantom show stiffer 3-mm inclusions in the myometrium. In the second phantom, strain images show the part of the endometrial polyps projecting into the endometrial cavity appeared stiffer and the part in the myometrium softer compared to the myometrium. Strain images from the Aloka and the third system were of lower quality than the Siemens Antares.

Conclusion: Durable uterine SIS phantoms with well-defined properties can be produced to allow realistic quantitative testing of SIS strain imaging using ultrasound.