AbstractID: 9601 Title: A Phantom for Functional CT/CBCT Breast Cancer Imaging

Purpose: Cone Beam CT (CBCT) breast scans are an emerging technology with the potential for a significant impact on breast imaging. Our purpose was to develop a phantom allowing us to test a method of achieving a Dynamic Contrast Enhanced (DCE) CBCT scan. This required a phantom that allows an injection of contrast that can change over time.

Method and Materials: The breast phantom(s), of which 2 were developed, were adapted from the shape and size of the CIRS (Norfolk, VA) breast phantom model 051. Our two phantoms were manufactured using a Stratasys rapid prototyping machine, model Vantage (Stratasys, Eden Prairie, MN). We inserted one lesion (phase I) or two lesions (phase II) with water/contrast able to flow through the lesions, and in phase II, water/contrast was also able to flow through the main cavity as background. The phantoms were quantified using the in-house GE Lightspeed CT machine, using a Manostat E-series (phase I)/ecoline VC-MC/CA8-6 (phase II) peristaltic pump for water flow, and the Harvard Apparatus PHD 22/2000 programmable syringe pump for injection of contrast.

Results: We scanned for four different types of uptake curves (impulse injection, plateau, increasing and decreasing), with 4-5 injections per trial, over 4 days/curve type, in order to completely quantify each phantom. This was done so as to have a reliable gold standard of curves for comparison with future CBCT curves. The impulse uptake curve can also be de-convoluted with its injection curve, in order to obtain a characteristic function for each lesion. Each of the other types of uptake curves can then be successfully predicted through convolution of this characteristic function with the respective injection curve.

Conclusion: Both phantoms have been successfully, fully quantified as to their characteristics with contrast injection, and are usable as phantoms to test our method for DCE-CBCT scanning.