AbstractID: 6670 Title: Quantification of Dynamic Contrast Enhancement in Breast Cone-Beam CT

Purpose: Contrast uptake behavior measured by dynamic contrast enhanced (DCE) MR has been shown to have diagnostic value for breast cancer. This paper is to show the feasibility of DCE breast cone beam CT (CBCT) for quantification of dynamic contrast uptake using a baseline and a single contrast enhanced CBCT.

Method and Materials: A novel algorithm is proposed to determine the contrast uptake behavior for breast CBCT with a baseline image followed by a contrast enhanced acquisition synchronized with contrast injection. The method is based on the assumption that the contrast uptake curve in every voxel of the volume has a washin and a washout phase governed by a 3-parameter equation, and the baseline along with the contrast enhanced projections are used to solve for these 3 parameters in each voxel. A computer simulation was performed based on functional CT data of cervix patients to evaluate the feasibility of the method to estimate different contrast uptake shapes. A phantom study was also done in a breast phantom with flow mechanism to compare the method against clinical CT for a fast washout and a plateau contrast uptake curve.

Results: The computer simulation showed excellent accuracy of uptake characteristics for the new method that the DCE-CBCT algorithm correctly determined the contrast uptake behavior in 14 out of 15 patients. Good agreement was also found in the phantom study in which both uptake curves (rapid washout and plateau) were accurately determined by the DCE-CBCT method compared to those measured with clinical CT, although the former curves are more dispersed.

Conclusions: Preliminary simulation and phantom data suggest the feasibility of the proposed method to determine different contrast uptake behavior in contrast enhanced breast CBCT which might have a potential for diagnosis of breast cancer.