Title: A Multi-Dimensional Description of Breast Anatomy Using Breast CT

Purpose: Accurate anatomical characterization of the breast is useful in breast phantom development, computer modeling of breast imaging technologies, and computer-aided diagnosis of various imaging tasks. Using the breast CT (bCT) data sets of women from a clinical trial, a number of two-dimensional (2D) and three-dimensional (3D) parameters which describe breast shape and composition are presented.

Methods: The diameter, length, and volume of the pendant breast were measured for 219 bCT data sets, grouped by bra cup size. Segmented bCT data sets were used to determine the volume glandular fraction (VGF). VGF was found as a function of patient age, BIRADS density, and bra cup size. The glandular fraction was examined in coronal (GFcoronal) and sagittal (GFsagittal) planes of the breast, and the radial distribution of breast glandular fraction (RGFn) within a coronal bCT image was examined for three breast regions. The areal glandular fraction (AGF) was estimated from 2D projections of the breast (simulated by linear integration of bCT data sets) and was compared to the corresponding VGF. A 3D probability map of fibroglandular distribution was simulated using the breast metrics found in this study.

Results: Breast diameter, length, and volume increase with increasing bra cup size. VGF was lower among older women and those with larger bra cup size. For each increasing BIRADS category, VGF increased by 5.62% ($p < 0.001$). VGF was also found to increase with AGF following a power function. Most fibroglandular tissue was distributed mainly in the central portion of the breast.

Conclusions: Breast anatomy was examined and a number of parameters were described. The reported data may provide useful information for breast modeling in various imaging or dosimetry tasks.