AbstractID: 5954 Title: Digital Breast Tomosynthesis

Both film-screen and digital mammography are subject to a number of fundamental limitations related to the projection process, whereby 2D images are produced of the 3D breast anatomy. Mammography can produce artifactual densities from the superposition of normal tissues that are separated in space; although only visible in a single view, these often appear sufficiently suspicious to necessitate a biopsy, leading to a loss in specificity. Furthermore, true lesions in mammograms can be masked by superimposed normal tissue and thereby rendered undetectable; this reduces the sensitivity of mammography.

Numerous tomographic methods have been proposed to overcome these limitations, including digital breast tomosynthesis (DBT). DBT is a tomographic imaging technique in which a set of tomographic images can be reconstructed from a limited number of x-ray projection images. DBT has the potential to mitigate against both the superposition of non-adjacent tissue (false positive densities) and the masking of real lesions (false negatives) observed in projection mammography, while also providing a simple means of localizing lesions in 3D. A preliminary retrospective study of breast tomosynthesis by Rafferty et al. has demonstrated a 16% increase in sensitivity and 85% decrease in false positives as compared to digital mammography. Our own experience at the University of Pennsylvania with 51 patients has provided supported anecdotal evidence.

DBT also offers the potential for functional imaging. Breast tumor growth and metastasis are accompanied by the development of new blood vessels. We have used a modified GE 2000D under IRB approval, to gain initial experience in contrast-enhanced DBT (CE-DBT). To date we have acquired 13 CE-DBT clinical cases. Suspicious enhancing lesions were demonstrated with CE-DBT in 10 of 11 cases of pathology-proven breast cancer. The cases illustrated that CE-DBT could provide information in concordance with multimodality imaging evaluation. The pre-contrast tomosynthesis images demonstrated lesion morphology and border characteristics in greater detail than the digital mammography images, and the CE-DBT data sets demonstrated vascular characteristics of the breast lesions of interest that were consistent with the vascular information provided by MR. In addition, quantitative evaluation of contrast uptake is anticipated to be more easily standardized with CE-DBT due to the linear relationship between attenuation and contrast concentration compared to MRI.

In this presentation, the following education objectives will be addressed:

1. Review the development and design of digital breast tomosynthesis systems.
2. Evaluate the results of the existing DBT clinical trials.
3. Examine advanced applications of DBT including contrast-enhanced DBT and CAD.
4. Compare DBT to other x-ray tomographic imaging modalities.