

Comparing the potential of digital and film-screen mammography

E. Nickoloff¹ (eln1@columbia.edu), A Dutta¹, Z Lu¹, S Smith¹, R Rosenblatt²

1. New York-Presbyterian Hospital & Columbia University, New York, NY, USA,

2. Cornell Medical Center, New York, NY, USA

Lay-language version of paper TU-C-517C-6

Tuesday, July 16, 2002

AAPM/COMP/CCPM Meeting, Montréal, Quebec

Digital and film-screen mammography each have certain strengths and weaknesses. The digital systems have a greater dynamic range (ability to measure, record and display large differences in the amount of x-rays incident upon the detector), an ability to enhance the displayed image with window and level adjustments (ability to display various combinations of darkness and contrast of the images), and image processing algorithms. Hence, one would anticipate that the digital systems have advantages in visualizing dense breast tissue, the chest wall, and the periphery of the breast in comparison to film-screen systems.

Currently the radiation doses utilized by digital and film-screen mammography systems are very similar (an average glandular dose to the average breast of about 1.5 to 2.5 milli-Gray). Care must be taken with digital mammography systems because these systems can be adjusted to use more radiation, which improves the image quality (by reducing the image background noise -- quantum mottle), but delivers higher radiation doses to patients. Unlike film-screen mammography, in which higher radiation doses produce darker images that are clinically less than optimal, higher radiation doses in digital mammography actually improve the ability to visualize low contrast structures in the breast. In fact, an advantage of digital systems is their ability to enhance the visualization of low contrast structures in all regions of the breast.

Film-screen systems have higher spatial resolution, and one would anticipate, would have advantages in detecting small, high contrast objects like calcium specks. Unfortunately, the contrast in film-screen system is determined at exposure by the equipment settings, film-screen selection and the film processing utilized by a facility. Failure to optimize each of these items could degrade the image quality. Moreover, because of the differences in the thickness and density of the breast at various regions such as the anterior periphery and the chest wall, the anatomy is not displayed on films with a consistent contrast and brightness.

Digital systems have the additional advantage of being able to be coupled with "Computer Assisted Detection (CAD) systems" which can help the radiologist to identify suspicious regions in the image. Other potential applications include: tomosynthesis imaging, dual energy imaging, facilitated image transport and storage, biopsy usage and other functions. However, until the resolution of digital systems improves and the cost of the systems diminishes, there will still be a place for film-screen mammography.

