Advances in breast x-ray imaging

Despite development and advances of new modalities, x-ray mammography remains the main screening tool for early detection of breast cancers. It also continues to play an important role in the diagnosis and management of breast cancers. X-ray mammography has relied on the use of high resolution screen/film combinations. Such techniques, although improved over the years, have the drawbacks of all the inconveniences and inflexibility associated with the use of film for image acquisition, storage and display. Motivated by search for better image quality and a general move towards filmless radiology, various digital mammography techniques have been developed, investigated and commercialized. These techniques can be largely divided into four types: amorphous silicon and selenium flat panel detector, amorphous silicon and cesium iodide flat panel detector, CCD and cesium iodide based slot scanning system, and storage phosphor imaging technique with dual-side image read out. Each of these systems has its unique advantages and disadvantages and achieves various degrees of clinical implementation. Typical of all digital mammography techniques is the potential compatibility with digital image archival, retrieval and distribution systems. Furthermore, the acquisition of breast images in digital format has begun to facilitate the development and investigation of many advanced imaging techniques. Among them, dual-energy mammography techniques have been developed to quantify breast tissue composition or to separate calcifications from the overlying tissue structures. Stereo-mammography has been developed to use two projection views to provide a 3-D perspective of the breast tissue structures, thus reducing the problem of overlapping structures. Tomosynthesis imaging pushes the idea of 3-D imaging further by acquiring 10-25 projection views and use them to synthesize images to depict the breast structures as a number of thick layers. More recently, cone beam breast CT has been developed and investigated to scan the breast in a dedicated manner and provide true 3-D images of the breast. Along a different direction, the development and investigation of various contrast mammography techniques have allowed x-ray imaging to be used to image and study breast vasculatures as possible indication of breast cancer.

In this presentation, we will try to achieve the following educational objectives:

1. Review the development and investigation of major digital mammography techniques
2. Review the development and investigation of various advanced breast x-ray imaging techniques

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