Automated Whole Breast Ultrasound

**Dr. Mendelson (PI)**

Co-Investigators: Drs. Neuschler, Rao, Solari, Wolffman

The project goal is to develop and validate an automated breast ultrasound (ABVS) examination that can be performed at the breast imaging center without the need for a physician. The system is designed to perform a complete breast examination in under 1 minute and to be used as an alternative to handheld ultrasound. The project aims to develop an ABVS examination that can be performed at the breast imaging center without the need for a physician. The system is designed to perform a complete breast examination in under 1 minute and to be used as an alternative to handheld ultrasound.

**Opto-acoustic Imaging - Dr. Neuschler (PI)**

Co-Investigator: Dr. Gupta

- **FUNCTIONAL IMAGING**
  - Combination of light and sound
  - High-resolution, high-contrast images to demonstrate presence of angiogenesis
  - Short laser pulse creates thermoelastic expansion
  - Acoustic waves propagate to surface of tissue and are detected by wideband ultrasonic receivers
  - Image contrast related to hemoglobin concentration and oxygen saturation
  - Designed to concurrently collect images in conjunction with Diagnostic ultrasound (co-registered OA and B-mode imaging).

**Breast MRI**

- **ACRIN 6702: A Multi-Center Study Evaluating the Utility of Diffused Weighted Imaging for Detection and Diagnosis of Breast Cancer**
  - Drs. Wang (PI) and Neuschler

- **High Risk Lesions and MRI**
  - Are there significant MR imaging or histological features of these lesions which can be used to predict upgrade to malignancy and avoid unnecessary surgical excisions?
  - Drs. Goldberg, Gupta and Hui

- **Efficacy of Specimen Radiography in MRI Guided Core Needle Biopsies**
  - Presented at ARRS 2014
  - Drs. Gupta, Goldberg, Su, Verma, Neuschler, Floereke, and Mendelson (PI)

Results show that high risk and malignant lesions are more likely to have calcifications on specimen radiography compared to benign lesions.

There is a strong correlation between specimen radiograph calcifications and the presence of calcifications on the pathology report.

Biopsies performed for extent of disease are more likely to have calcifications than those for screening MRI.

There is no correlation between non-mass enhancement and presence of calcifications on specimen radiography.

**Screening Breast Ultrasound**

Team Building for Organizing and Offering Supplemental US Screening for Women with Mammmographically Dense Breasts, a New Service at Lynn Sage Breast Imaging

- With hospital and departmental support, a one-day training program with faculty of 5 breast imaging physicians and 2 technologists, all experienced in breast ultrasound will offer a one-day training session that includes formal presentations as well as hands-on workshops with models for handheld and automated breast ultrasound.

- Invites are Northwestern’s breast sonographers and dual mammography-ultrasound technologists, breast imaging physicians, and Breast and Women’s imaging follows.

- A pretest distributed the week before the meeting will be turned in at the start of the meeting, the posttest taken at the conclusion of the meeting with scoring and review prior to adjournment as a means of documenting educational benefit of the session.

The program will afford 6.5 hours of ASRT CE credit for technologists at no cost to attendees. Northwestern Category 1 CME credit for physicians was not sought because of prohibitive cost, which would have exceeded the low budget expenditures. Physician faculty time for lecture preparation and presentation is donated; technologist faculty members are compensated according to their NMH agreements.

- The educational and organizational benefit of the cooperative technologist-physician team will be analyzed for continuation of such program models, for screening planning based on evidence of efficacy, and for possible recommendation to other departments or to radiological organizations such as the American College of Radiology.

---

**RSNA 2014 Abstract**


Northwestern University, Foremost School of Medicine, Department of Radiology; Northwestern Imaging Program, Pittsburgh, PA

**BACKGROUND**

Breast lesion detection using hand-held US remains a diagnostic uncertainty as radiologists struggle to interpret images. Providing a second opinion can help improve diagnostic confidence. However, the primary disadvantage of this practice is the lack of an automated, objective, and reproducible method of assessment.

**OBJECTIVES**

The primary objective of this project was to determine the sensitivity and specificity of the Acuson S2000 ABVS™ (Automated Breast Volume Scanner, Siemens Health Systems) compared with hand-held physician performed breast ultrasound.

**METHODS**

All datasets were acquired from a cohort of 200 women enrolled at Northwestern (2107 total from 16 sites nationwide). Women with BI-RADS 4 or BI-RADS 5 lesions underwent an opto-acoustic (OA) study prior to biopsy. Women with BI-RADS 3 lesions underwent an initial OA study and are returning for a one year follow-up OA exam.

- Endpoints:
  1. Does OA (device) have clinically acceptable PPV and NPV for breast cancer?
  2. Does it achieve high degree of concordance with biopsy outcome?
  3. Does it improve classification accuracy for masses classified as BI-RADS 4A and 4B?

**PIONEER-01 Trial**

- A Pivotal Study of Imaging with Opto-acoustics to diagnose breast masses detected by mammography and/or clinical findings: A New Evaluation Tool for Radiologists

- Multi-site FDA trial, IRB-approved, HIPAA-compliant

- Funded by a grant from Sono Medical

- 200 women enrolled at Northwestern (2107 total from 16 sites nationwide)

- Women with BI-RADS 4 or BI-RADS 5 lesions underwent an opto-acoustic (OA) study prior to biopsy. Women with BI-RADS 3 lesions underwent an initial OA study and are returning for a one year follow-up OA exam.

**RSNA Poster**

**Near-field opto-acoustic sensor array for improved breast cancer detection: finding the sweet spot**

Drs. Wang and Graber

Rita Mahadevia (medical student)

**Breast cancer in young women: imaging features, histopathology, and patient characteristics**

Drs. Wang and Delitch