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Size and Extent of Breast Cancer: Comparison of Mammography, MRI, and Positron Emission Mammography (PEM) in Women with Core Biopsy Diagnosis.

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Category IIA1: Breast radiology

OBJECTIVE: We compared mammography, magnetic resonance imaging (MRI), and PEM for determining size and extent of breast cancer.
METHODS: 27 women with core biopsy proven breast cancer had mammography, MRI, and PEM followed by lumpectomy or mastectomy. 23 of these women also had preoperative targeted ultrasound (ULS). Five radiologists were asked to review each imaging study without knowledge of the surgical findings or other imaging studies, and to estimate the size of the cancer and any additional lesions in either breast. Imaging results were compared to surgical pathology results, and women placed in four clinically relevant categories.
RESULTS:
(1) There were 9 women in whom all 4 modalities accurately depicted tumor size and location within 8 mm, one additional within 11 mm.
(2) In 3 women, the cancer was visible by mammography and one of the other tests was potentially misleading: in one PEM was negative, in one MRI incorrectly predicted contralateral disease, and in the third woman ULS, MRI and PEM all incorrectly predicted contralateral disease.
(3) In 9 women mammography did not adequately demonstrate the cancer. 5 women had benign mammograms and additional imaging because of lumps (3), nipple discharge (1) or extensive calcifications (1); cancer was accurately depicted by ULS in 4 and by MRI and PEM in all 5. 4 women had their cancer size significantly underestimated by mammography and ultrasound but accurately depicted by PEM and MRI.
(4) In 5 women all imaging modalities were potentially misleading, underestimating extensive ductal carcinoma *in situ* in 4.

MRI and PEM were discordant in 7 women, 5 of whom have had follow-up. MRI was correct in one woman regarding absence of bilateral disease. PEM was correct in two women, one regarding absence of bilateral disease, and one regarding absence of disease in two quadrants. In two patients, MRI was correct in diagnosing cancers smaller than a centimeter; PEM interpretation was adversely effected by positioning (1), and post biopsy hematoma (1).
CONCLUSIONS: Mammography will remain the mainstay in breast cancer diagnosis. In almost half (13/27; 48%) this relatively inexpensive and readily available modality adequately depicted the tumor. However a third of women (9/27; 33%) would have been significantly under diagnosed without ultrasound (4) and MRI or PEM (5), receiving either no surgery, or lumpectomy instead of mastectomy. We are including MRI and PEM in our evaluation of women with newly diagnosed breast cancer.