Title: Predicting Breast Tumor Size for Pre-operative Planning: Which Modality is Best?

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Objectives:
The key to effective treatment is early detection and proper surgical planning, which is made possible by many screening modalities, including clinical breast exam (CBE), mammography (Mam), ultrasound (U/S), and breast magnetic resonance imaging (MRI). Previous studies have proven that breast MRI is more accurate at detecting breast tumors than mammography. However, MRI is not a specific test, with many documented cases of false positives, which suggests it may be an unnecessary test for most women. Since the cost of these modalities is vastly different, it is important for physicians to know the accuracy of the various tests. This study aims to compare the tumor size predicted by imaging modality to the actual pathologic size in order to determine which imaging modality is best at estimating tumor size.

Methods:
Institutional IRB approval was obtained prior to querying the Women and Infant’s Hospital weekly Breast Tumor Board files from January 2010 to December 2010 to identify all patients with a diagnosis of grade 1 to 3 biopsy-proven invasive ductal (IDC) or lobular (ILC) carcinoma. All patients who had a preoperative imaging study and surgical removal of the tumor at Women and Infant’s Hospital were included. Data recorded included demographic information, tumor characteristics, maximum dimension predicted by available imaging, and maximum dimension determined by final pathology. Results of maximum dimension predicted by imaging were correlated to final pathology size. Spearman correlations were calculated and compared by Zou’s method and agreement was assessed by weighted kappa statistics. Continuous variables were compared by t test.

Results:
❖ Over 12 months, a total of 263 patients with breast tumors were identified through the breast tumor board files.
❖ Of the 263 breast tumors analyzed, 208 were positive for estrogen receptors (ER), 177 were positive for progesterone receptors (PR), and 209 were positive for both hormone receptors (HR). HER2Neu receptors were positive in 49 of the tumors.
Of those patients, 84 had documented predicted tumor sizes from mammography, 231 from ultrasound, 168 from MRI, and 41 from clinical breast exam.

Of the estimated sizes predicted by mammography, 65 were within range of the final pathologic tumor size, 3 underestimated the size, and 7 overestimated the size.

Of the estimated sizes predicted by ultrasound, 192 were within range of the final pathologic tumor size, 10 underestimated the size, and 2 overestimated the size.

Of the estimated sizes predicted by MRI, 135 were within range of the final pathologic tumor size, 6 underestimated the size, and 3 overestimated the size.

Of the estimated sizes predicted by clinical exam, 33 were within range of the final pathologic tumor size, 2 underestimated the size, and 2 overestimated the size.

Conclusions:

- Mammography, MRI, and CBE are more likely to overestimate the size of a breast tumor. CBE is most likely to overestimate. U/S is least likely to overestimate.
- U/S is more likely to underestimate tumor size. CBE is least likely to underestimate.
- MRI and U/S are both strongly correlated with pathologic size overall and within grades in both IDC and ILC. Mammography is moderately correlated overall and by grade (p<0.0001).
- There is no significant difference between estimates of pathologic size by U/S and MRI (p<0.05).
- The correlations between MRI or U/S and pathologic size are significantly better than the correlations between mammography or CBE and pathologic size (p<0.05).
- These correlations do not differ significantly when the data is stratified by receptor status.