Breast cancer tumor size: Correlation between MRI and histopathology

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Purpose

Accurate tumor extent estimation has become more important now due to advances in breast cancer management like BCT. Local recurrence after breast conservation treatment (BCT) and radiotherapy (RT), which occurs in 3-9% of patients is usually caused by incomplete excision or multifocality not diagnosed preoperatively [1]. Preoperative tumor extent is also important with increasing use of neoadjuvant chemotherapy which is entirely dependent on preoperative tumor size and advocated for all T3 and T4 cancers. Additionally, initial tumor size is also a predictor of subsequent response to CT and eventual prognosis [2]. MRI has emerged as the tool for further evaluation of tumor extent and detection of synchronous tumors [3].

The aim of our study was to evaluate the contribution of preoperative breast MRI in assessing the extent of disease.

To determine correlation between MRI and histological size.

To assess the possible causes of over and underestimation of disease on MRI.

Methods and Materials

All breast MRI examination between April 2006 and March 2009 were identified from Radiology information System (RIS) database (n=183). Mean age at presentation was 55 years; age range 19-89. MRI and Histopathological correlation was available for 93 patients. All Patients with histologically confirmed benign conditions and patients who went on to have neoadjuvant therapy were excluded from the study. All MRI scans were performed as an adjuvant to conventional imaging.

Technique:
All scans were performed on a 1.5 T Siemens Symphony MR scanner with Siemens CP breast array coil. Our protocol was based on the MARIBS Trial. Contrast dose of 0.2 mmol per kg bodyweight of Gadopentetate Dimeglumine (Gd DTPA (Multihance-Bracco Diagnostic) was used.

Two experienced radiologists evaluated by consensus the result of MRI, conventional imaging and clinical data. Histopathological results were available to both readers at the time of this review.

The longest axis of tumour in any plane was taken as the maximum size on subtracted and reconstructed images.

Pathology: Pathological details were obtained from APEX (laboratory IT )system. Maximum tumour size, type, grade and lymph node status was recorded.

Statistical Methods: Pearson's correlation coefficient was calculated for MRI versus pathological size. In case of multifocal disease, the size of whole tumour area was used whenever available. Pathological size was considered the gold standard and MRI measurements were considered concordant when size was within 10 mm of pathological size. Using stricter criteria a size difference of +/- 4 mm was also taken to assess accuracy of MRI. Tumor was considered to be underestimated if MRI size was less than 10 mm smaller than pathological size and overestimated if more than 10 mm larger on MRI.

P values smaller than 0.05 were considered significant in all cases.

Results

Significant correlation was seen between MRI and pathological size. p value 0.001. Histological assessment corresponded with MRI findings in 50 (53.5%) out of 93 patients when 10 mm was taken as the concordant value. MRI and histopathology correlated with each other in 21 patients if 3 mm was used as cut off. MRI overestimated size by >10 mm in 20 (21.5%) and underestimated size by < 10 in 18 (19.4%) patients. 3 patients had unnecessary surgery due to false positive MRI. All these patients had significant benign changes confirmed as Xanthomatous inflammation with LCIS in one patient, Granulomatous mastitis in other and extensive LIN in the third patient.

UNDER and OVERESTIMATION:
Tumours were underestimated in 20 patients. Of these, 10 had DCIS, 6 had Lobular cancers and 4 had IDC. Average size of tumor underestimation was 42.4 mm. Maximum size underestimation was by 118 mm where histology confirmed 2 separate foci of DCIS 75 mm and 60 mm while MRI size was reported as 17 mm but this was regarded as suboptimal scan due to significant patient movement.

Tumor was overestimated in 18 patients. 5 of these could be attributed to concurrent LIN, sclerosing adenosis, LCIS, LIN and fibrocystic disease. Six patients had lobular cancers and in 2 patients scan was suboptimal.

Maximum tumor size overestimation was by 30 mm. MRI reported the tumor size as 60 mm while histologically it was confirmed as a 30 mm ILC with florid benign change.

Images for this section:

<table>
<thead>
<tr>
<th>MRI / HP Correlation</th>
<th>Patient Number (Total= 93)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONCORDANT</td>
<td>50 (53.7%)</td>
</tr>
<tr>
<td>Within &lt;= 4 mm</td>
<td>31</td>
</tr>
<tr>
<td>Within 5-10 mm</td>
<td>19</td>
</tr>
<tr>
<td>DISCORDANT</td>
<td>43 (46.3%)</td>
</tr>
<tr>
<td>Underestimated</td>
<td>20</td>
</tr>
<tr>
<td>Overestimated</td>
<td>18</td>
</tr>
<tr>
<td>False positive</td>
<td>3</td>
</tr>
<tr>
<td>False negative</td>
<td>2</td>
</tr>
</tbody>
</table>
**Fig. 1:** This table summarizes the results of our study and correlation between MRI and histopathology.

**Fig. 2:** Coronal subtracted dynamic image of a 60 year old patient. MRI measurements were 43mm. Benign enhancement noted in right breast. Histology: 91 mm IDC with florid benign changes and LIN. Followup MRI of right breast was normal.

**Fig. 3:** Axial section RT breast subtracted post contrast image showing 50 mm area of enhancement. It had a malignant enhancement curve. Histology: Granulomatous mastitis.
**Fig. 4:** High resolution axial image. MRI showed 3 masses interconnected with each other with maximum dimension of 43 mm. Patient had mastectomy. Histology 29 mm IDC and ILC.
Conclusion

While MRI offers advantage of high sensitivity, disadvantages include false positives findings that require unnecessary biopsies, prolongation of presurgical workup which adds to patients distress, higher cost of treatment and potential of over and under estimation of tumor size[4,5]

There is a high degree of correlation between MRI and histological tumor measurements. However imperfect accuracy of tumor size estimation precludes its use as a sole determinant of appropriate surgical measurement.

References

1. R.M Mann, j.Veltman etal. The value of MRI compared to mammography in assessment of tumout extent in invasive lobular carcinoma of the breast EJSO 2008;34:135-142


Personal Information