Accuracy of the MRI in the assessment of axillary lymph node involvement in women with breast cancer after neoadjuvant chemotherapy

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Background

• Lymph node assessment after neoadjuvant chemotherapy (NCT) is important for the preoperative planning, particularly for cases with axillary metastases downstaging.

• This study aimed to estimate diagnostic accuracy of clinical examination (CE) and magnetic resonance imaging (MRI) in the prediction of lymph node status in women with breast cancer submitted to NCT.

Methods

• This is a cross-sectional study.

• Sample comprising 207 women with invasive ductal carcinoma treated between January 2006 and April 2016.

• All women were submitted to NCT with anthracyclines and taxanes concomitantly with trastuzumab for those overexpressing HER2.

• At the end of the neoadjuvant treatment, all patients were clinically evaluated (CE) by two breast surgeons and post-chemotherapy MRI was performed in all patients (double reading by specialized radiologists in all cases).

• All women were submitted to axillary lymphadenectomy.

• For both CE and MRI, we have estimated sensitivity (Se), specificity (Sp), positive (PPV) and negative predictive values (NPV), as well as overall accuracy (A) in predicting lymph node status after NCT using pathology evaluation as the gold standard.

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• Area under ROC curve and corresponding 95% confidence intervals (95% CI) were calculated for the entire group and also according to molecular subtypes.

Results

• Age ranged from 25 to 79 years (median=49) and most women were white (64.7%).

• Most of patients presented with 12 tumors (44.4%) and 151 women (73%) had clinical N+ at baseline.

• Overall, CE had significantly lower Se than MRI, but higher Sp. However, both PPV and NPV were similar (Table 1).

• In the stratified analysis according to molecular subtype, it was possible to notice that MRI had better diagnostic performance in the group of women with triple-negative breast cancer (PPV=81.8% and NPV=74.2%), being superior to CE in the prediction of lymph node involvement (MRI=area under ROC curve=0.725; CE=0.509) (p=0.003) (Table 1) (Figure 1).

• On the other hand, among women with HER-2 pure tumors, clinical examination (area under ROC curve=0.562) was slightly superior to MRI (area under ROC curve=0.471) (p=0.487), but this difference was not statistically significant (Table 1) (Figure 2).

Conclusions

• The results have shown that MRI is superior to CE in the assessment of lymph node status in women with triple-negative (TN) breast cancer submitted to NCT.

• In the remaining subtypes, both CE and MRI presented similar results (low Se, area under ROC curve close to 0.50), showing that neither method is satisfactory to predict axillary lymph node status after NCT.

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#256736

Table 1. MRI and CE diagnostic accuracy measures according to molecular subtype.

<table>
<thead>
<tr>
<th>Category</th>
<th>Exam</th>
<th>Se (%) (95% CI)</th>
<th>Sp (%) (95% CI)</th>
<th>PPV (%) (95% CI)</th>
<th>NPV (%) (95% CI)</th>
<th>A (%)</th>
<th>Area under ROC curve (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>CE</td>
<td>7.0 (3.1-14.4)</td>
<td>98.1 (92.7-99.7)</td>
<td>77.8 (45.2-93.7)</td>
<td>53.0 (46.1-59.8)</td>
<td>58.4</td>
<td>0.526 (0.497-0.554)</td>
</tr>
<tr>
<td></td>
<td>MRI</td>
<td>30.0 (21.4-40.1)</td>
<td>85.0 (76.5-90.9)</td>
<td>65.2 (49.7-78.2)</td>
<td>56.5 (48.5-64.2)</td>
<td>54.1</td>
<td>0.575 (0.519-0.632)</td>
</tr>
<tr>
<td>Th</td>
<td>CE</td>
<td>5.9 (0.3-30.8)</td>
<td>96.0 (77.9-99.8)</td>
<td>50.0 (7.5-90.5)</td>
<td>60.0 (44.6-73.6)</td>
<td>59.5</td>
<td>0.509 (0.439-0.579)</td>
</tr>
<tr>
<td></td>
<td>MRI</td>
<td>52.9 (28.5-76.1)</td>
<td>92.0 (72.5-98.6)</td>
<td>81.8 (47.7-99.8)</td>
<td>74.2 (55.1-87.5)</td>
<td>76.2</td>
<td>0.725 (0.591-0.860)</td>
</tr>
<tr>
<td>Luminal</td>
<td>CE</td>
<td>7.8 (2.5-19.7)</td>
<td>96.1 (78.4-99.8)</td>
<td>80.0 (37.5-96.4)</td>
<td>83.3 (59.9-97.1)</td>
<td>86.3</td>
<td>0.757 (0.660-0.853)</td>
</tr>
<tr>
<td></td>
<td>MRI</td>
<td>19.4 (10.3-33.5)</td>
<td>92.3 (73.4-98.6)</td>
<td>86.2 (50.0-97.1)</td>
<td>83.8 (52.6-94.9)</td>
<td>84.2</td>
<td>0.599 (0.468-0.735)</td>
</tr>
<tr>
<td>HER2+</td>
<td>CE</td>
<td>6.7 (0.3-33.9)</td>
<td>100.0 (86.3-100)</td>
<td>100.0 (5.5-100.0)</td>
<td>68.9 (53.2-81.4)</td>
<td>68.9</td>
<td>0.533 (0.468-0.599)</td>
</tr>
<tr>
<td></td>
<td>MRI</td>
<td>26.7 (10.3-50.3)</td>
<td>77.4 (53.4-96.8)</td>
<td>90.9 (54.0-99.7)</td>
<td>86.6 (50.6-97.1)</td>
<td>60.9</td>
<td>0.520 (0.382-0.658)</td>
</tr>
<tr>
<td>HER2-2</td>
<td>CE</td>
<td>12.5 (4.4-46.4)</td>
<td>100.0 (71.6-100)</td>
<td>100.0 (20.6-100.0)</td>
<td>65.0 (43.3-81.9)</td>
<td>66.7</td>
<td>0.562 (0.440-0.685)</td>
</tr>
<tr>
<td></td>
<td>MRI</td>
<td>25.0 (4.4-66.4)</td>
<td>69.2 (38.9-89.6)</td>
<td>93.5 (60.7-98.6)</td>
<td>80.0 (32.5-92.5)</td>
<td>52.4</td>
<td>0.471 (0.264-0.678)</td>
</tr>
</tbody>
</table>

Figure 1. MRI and CE ROC curves, TN tumors. Figure 2. MRI and CE ROC curves, HER-2 pure tumors.