Effectiveness of Ultrasonography in Detection of Loco-regional Recurrence of Breast Cancer

Mai Sayed Khalifa¹, MohmmedSoliman Gaber¹, Walid Omar Soliman²
¹Department of Clinical Oncology & Nuclear Medicine, Sohag Faculty of Medicine, Sohag University.
²Department of Nuclear Medicine, National cancer institute-Cairo.

Introduction

Breast cancer is the most common type of cancer and the second leading cause of cancer-related death among women (¹). The estimated incidence in 2018 was 2.088 million of new cases in the world (²). Breast cancer was the most common cancer among women and the third leading cause of cancer-related death in Egypt (³).

Loco-regional recurrence of breast cancer (LRR) is defined as recurrence in the ipsilateral breast or axillary lymph nodes (⁴). It is a major clinical manifestation and may occur in 5-27% of patients (⁵). Early detection and treatment of isolated LRR before symptomatic onset may have a beneficial effect on the prognosis, by improving local treatment feasibility rate and by avoiding the situation of uncontrollable loco-regional disease (⁶).

Breast US has been popularly used to characterize lesions and differentially diagnose breast masses as an adjunctive tool to mammography, particularly in women with dense breasts (⁷). It is a widely available, relatively inexpensive imaging method that is easy to perform, has no radiation hazards, does not require a contrast agent, and enables biopsy under image guidance (⁸).

Several studies have shown surveillance results of the US applied to women who were treated for breast cancer. The reported cancer detection rates were 1.7-5.1% per patient, and the positive predictive value was 21.5-52.6%, with percentages varying according to the area involved (⁹). Although US may have its strong points for visualizing areas that cannot be approached by mammography or provide additional information regarding the differentiation between postoperative changes and LRR, little evidence suggests whether US is effective and beneficial for improving survival of patients with breast cancer and the role of US in post-treatment surveillance programs has yet to be investigated (⁹).

This study was designed to evaluate the effectiveness of US imaging in the diagnosis of LRR of breast cancer.

Patients and Methods:

The Ethical and Research committees at the Faculty of Medicine, Sohag University approved this prospective study. All participants assigned informed written consent. The study included 45 female patients with histopathologically proven breast cancer managed by mastectomy +/- chemotherapy and/or radiotherapy with post-treatment tumor-free interval.

Exclusion criteria:

Patients with proved other malignancy (Double primary) were excluded. Pregnant females, as well as patients with proved LRR and/or distant metastasis, were also excluded.

Study design:

I- History: Detailed history was obtained from all patients with the help of their datasheets. The pathological reports as regards the initial type of cancer and its grading, tissue infiltration, and axillary lymph nodes involvement, as well as the expressed receptors (ER, PR, HER2, and Ki67) were recorded. The post-operative
therapeutic history (Chemotherapy and/or radiotherapy) was documented.

II- Sono-mammography: Breast US was done for all patients by an expert radiologist with a high-frequency linear array transducer (L8-14 MHz). The breast was examined for any nodules or cysts. The shape of the solid lesions, boundary, echogenicity, calcification, enhancing or decreasing of post-lesion and color Doppler signal in the breast were observed.

Any thickening or nodules in the chest wall was recorded. The axilla was examined for any abnormality in the axillary lymph nodes. The location, size, shape, internal echo, lymph hilum, cortico-medullary structure, and flow pattern of lymph node were explored. Lymph nodes were categorized as suspicious if they exhibited one or more of the following characteristics: overall enlargement, cortical thickening, or eccentric cortical lobulation with obliteration of echogenic hilum, irregular shape, loss of fatty hilum, or round shape.

III- Tissue biopsy: Tissue biopsy was obtained from patients whenever it was possible (Only in 14 patients). Specimens were prepared for histopathological examination for recurrence.

IV- Statistical analysis: Data were recorded in Excel datasheet and analyzed using Statistical Package for Social Sciences software program (SPSS, version 24). Qualitative variables were recorded as frequencies and percentages and were compared by chi-square test. Quantitative variables were presented as means ± standard deviation (SD). Sensitivity, specificity, positive predictive value, negative predictive value, and accuracy were calculated. $P$-value < 0.05 was considered statistically significant.

Results

The mean age ± SD of the patients was 58.47±9.1 years (Range= 40-77 years). The vast majority of the patients had either CBS or MRM (18/45; 40% for each). Radical mastectomy was done in 8 cases (17.8%). Around half of the cases (22 cases, 49%) had isolated left-sided tumors, with 16 cases (35.5%) had isolated left-sided tumors.

Sono-mammography findings:

Axillary lymph nodes were detected abnormal in 10 cases (22.2%). Breast cyst in one case and breast nodules were found in 12 cases (26.7%), and chest wall nodule or thickening was detected in 8 cases (17.8%).

Sonomammography performance in detecting LRR:

By comparing the sonomammography for signs of recurrence with the results of biopsy or follow up; it was found that US accuracy was 71.46%, sensitivity (69.23%), and specificity (73.68%) (Table 1).
Table 1: Performance of ultrasonography in detecting LRR.

<table>
<thead>
<tr>
<th></th>
<th>Sonography</th>
<th>Biopsy or follow up</th>
</tr>
</thead>
<tbody>
<tr>
<td>True positive (TP), n</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>True negative (TN), n</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>False-positive (FP), n</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>False-negative (FN), n</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Sensitivity (%)</td>
<td>69.23</td>
<td></td>
</tr>
<tr>
<td>Specificity (%)</td>
<td>73.68</td>
<td></td>
</tr>
<tr>
<td>Positive predictive value (%)</td>
<td>78.26</td>
<td></td>
</tr>
<tr>
<td>Negative predictive value (%)</td>
<td>63.64</td>
<td></td>
</tr>
<tr>
<td>Accuracy (%)</td>
<td>71.46</td>
<td></td>
</tr>
</tbody>
</table>

Discussion

LRR of breast cancers a major clinical manifestation and may occur in 5-27% of patients\(^5\). Early detection of recurrence has a value in decreasing the breast cancer-associated morbidity and mortality\(^10\). Breast US may have a role in diagnosis of LRR of breast cancer with variable results in the previous studies\(^9\).

In the present study; the sensitivity of the US in detection of LRR of breast cancer was 69.23%. This was similar to previous reports by Shin et al.\(^11\) (70.59%) and Lamuraglia et al.\(^12\) (66.67%). However; this sensitivity was less than previously reported by Winehouse et al.\(^13\) (93.75%), Ternier et al.\(^14\) (86.54%), Yilmaz et al.\(^15\) (90%), Stuhrmann et al.\(^16\) (94%), and Riebe et al.\(^17\) (90.91%). This may be related to the use of Contrast-enhanced color Doppler with more sensitivity.

In the current study; specificity of the US in the detection of LRR of breast cancer was 73.68%. This was similar to previous reports by Winehouse et al.\(^13\) (66.67%), Ternier et al.\(^14\) (72.55%), Stuhrmann et al.\(^16\) (71.69%), and Riebe et al.\(^17\) (68.75%). However; this specificity was less than previously reported by Yilmaz et al.\(^15\) (88.24%), Shin et al.\(^11\) (98.29%). This may be related to the combined use of clinical examination and mammography results. Higher specificity was also reported by Lamuraglia et al.\(^12\) (97.5%) and this may be related to the use of Doppler US with perfusion software and contrast agent injection.

In this study; the accuracy of the US in detection of LRR of breast cancer was 71.46%. This was similar to previous reports by Winehouse et al.\(^13\) (74.14%), Ternier et al.\(^14\) (79.61%), Stuhrmann et al.\(^16\) (75%), Riebe et al.\(^17\) (77.78%). Higher accuracy was previously reported by Yilmaz et al.\(^15\) (88.89%), Shin et al.\(^11\) (97.82%). This difference may be explained by the combined use of clinical examination and mammography results. Moreover; Lamuraglia et al.\(^12\) also reported higher accuracy (90%). They used Doppler US with perfusion software and contrast agent injection for more accurate detection of LRR\(^12\).

The results of this study confirm the added value of the use of breast US for the detection of recurrence of breast cancer. However; the use of
more than one modality of diagnosis may give more accurate results.

References:

