ElastoScan™ in breast ultrasound: a novel technique is improving diagnostic accuracy

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Abstract

ElastoScan™ is a novel ultrasound technique, which visualizes the elasticity of tissue and is thus improving diagnostic accuracy when used in combination with standard ultrasonographic procedures. In this paper examples of ElastoScan™ in breast ultrasound are shown and described in order to elucidate the benefit of this method. Breast ultrasound elastography is easily applied during a standard examination and rapid results can be interpreted instantaneously. It is therefore being adopted by an increasing number of clinicians as a daily diagnostic routine.

Methods

In the examples shown below, ultrasound was carried out using the Samsung Medison Accuvix V20 Prestige system. Real-time elastography using ElastoScan™ was performed with a 5-13 MHz linear transducer. Most women underwent the examination for screening purposes, however some patients were examined because of a palpable breast lump or on routine follow-up after breast cancer therapy. Each breast was examined systematically in B-mode. Detected lesions were carefully assessed using the following standard criteria: Shape, margin, orientation, lesion boundary, echogenic pattern, posterior acoustic features, effect on surrounding tissue, calcifications and vascularisation using colour Doppler. They were then classified according to the BI-RADS score. This standard approach was immediately followed by the elastographic examination. For this purpose, the transducer was not moved from the previous
Table 1. BI-RADS classification system

<table>
<thead>
<tr>
<th>BI-RADS category</th>
<th>Radiological finding</th>
<th>Recommended approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Presence of a radiological finding requiring evaluation with a complementary imaging method</td>
<td>Further evaluation with other imaging method is required</td>
</tr>
<tr>
<td>I</td>
<td>No radiological finding is observed. The study is normal</td>
<td>12 month radiological follow-up is suggested</td>
</tr>
<tr>
<td>II</td>
<td>Benign radiological findings</td>
<td>12 month radiological follow-up is suggested</td>
</tr>
<tr>
<td>III</td>
<td>Probably benign radiological findings (with &lt; 2% chance of malignancy). This specific case includes clustered, punctate, isodense micro calcifications, regular, well-defined mass and non-palpable focal asymmetry suggestive of confluent fibro glandular tissue</td>
<td>6 month radiological follow-up is suggested</td>
</tr>
<tr>
<td>IV</td>
<td>Presence of radiological findings suspicious for malignancy with a risk for malignancy ranging from 2% to 95%</td>
<td>Further diagnostic investigation is required. Biopsy is recommended</td>
</tr>
<tr>
<td>V</td>
<td>Highly suspicious radiological findings, with a malignancy risk greater than 95%</td>
<td>Further diagnostic investigation is required. Biopsy is recommended</td>
</tr>
<tr>
<td>VI</td>
<td>Proven malignant lesion</td>
<td>-</td>
</tr>
</tbody>
</table>

position and only slight pressure was applied. The colour map 4 was used with red indicating soft tissue or fluid and purple indicating hard tissue.

Examples

Figure 1 shows the scan of a breast screening ultrasound of a 47-year-old female. The lesion was non-palpable, 14 x 13 x 11 mm in size, irregularly shaped, hypoechoic with indistinct margins. There was posterior shadowing, disruption of the surrounding tissue architecture and suspicious adjacent vascularisation. The lesion was therefore classified BI-RADS V. The ElastoScan™ revealed the stiffness of the tumour, indicated by blue to purple colour in contrast to the soft surrounding fibroglandular and fat tissue indicated by red and yellow colour. This information did not only support the suspicion of malignancy, but also contributed to the identification of the tumour boundaries, indicating a wider tumour expansion laterally but not posteriorly. Core needle biopsy revealed invasive-ductal carcinoma.

Figure 2 is a scan of a 60-year-old woman with macromastia and status post breast surgery with extirpation of a fibroadenoma. There was a diffuse hypoechoic area. The ElastoScan™ revealed the softness of the tissue indicated by yellow and red colour. Therefore, with knowledge of the
patient’s history of surgery, the changes were attributed to post-operative scarring. This was supported by mammography. No core-needle biopsy was performed.

Figure 3 depicts the scan of a 57 year-old female with mastodynia. There was a non-palpable hypoechoic lesion of ovaloid shape with only discretely irregular margins, horizontal orientation, distinct boundaries, posterior enhancement and no calcifications or suspicious vascularisation. The lesion was classified BI-RADS II. The ElastoScan™ showed yellow and red colour of the lesion and yellow and blue colour of the surrounding fibroglandular tissue supporting the benign aspect. The lesion was classified BI-RADS II and therefore biopsy was not required.

Figure 4 and figure 5 pictures the scans of a 32-year-old woman with palpable lymphadenopathy on routine annual check-up. Breast ultrasound showed no lesions. The palpable lymph node showed loss of the typical target structure and a suspicious vascularisation on colour Doppler imaging. The ElastoScan™ indicated the node as soft indicated by red and yellow colour. Because of the irregular vascularisation the lymph node was removed and histology revealed a benign castleman-lymphoma.

Figure 6 depicts the scan of a 71-year-old female who had a round hypoechoic lesion on a screening breast ultrasound. Conventional ultrasound criteria led to the BI-RADS classification II, but the ElastoScan™ showed that the lesion was hard. Mammography showed a calcified intramammary lymph node in the same region. Because this finding had been seen before, no biopsy was performed. After 5 months, the sonographic aspect was unchanged.

Conclusion
There are a growing number of studies, which indicate the diagnostic value of elastography when added to conventional breast ultrasound (4-6). Especially in BI-RADS III lesions, an elastogram that shows relative softness can be reassuring and thus prevent unnecessary breast biopsy. Our clinical experience shows, that ElastoScan™ is easily conducted and gives
results instantaneously. Elastography should always be used in combination with conventional ultrasonography and further studies need to be done to show the sensitivity and specificity of the technique. In the future, elastographic findings should be included as an independent criterion in the BI-RADS score. Although we cannot yet abstain from breast biopsy in BI-RADS IV conventional ultrasounds, even if the ElastoScan™ shows softness, we will continue to use it in order to support our breast ultrasound diagnosis and in many cases to reassure our anxious patients.

References


