Clinical Application of Real-time Tissue Elastography on Skin Lesions

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The purpose of this study was to evaluate the diagnostic performance of Elastography by using the extended combined autocorrelation method to differentiate benign from malignant skin lesions. 30 benign lesions and 32 malignant tumors were examined. All benign lesions showed as an evenly shaded green area or a mosaic of green and blue. In malignant tumors, 30 showed as a deep blue area and 2 showed as a mosaic of green and blue. These results suggest that it is useful for differential diagnosis of skin tumors to use Elastography.

Key Words: Elastography, Ultrasound, Skin tumors

1. Introduction

With the advances in ultrasound systems, high frequency ultrasonography came to be used for diagnosing skin disease. The conventional examinations (B-mode, color Doppler, etc.) were superior in real time but tissue characterization sometimes resulted in difficulty in diagnosing due to insufficient signal.

Recently, new diagnostic equipment, that is, Elastography, was developed. There have been reports that diagnosis by Elastography is effective for breast tumors, thyroid diseases and lymph node metastasis. We evaluated the diagnostic performance of Real-time Tissue Elastography by using the extended combined autocorrelation method to differentiate benign from malignant skin lesions. We used pathologic diagnosis as the reference standard.

2. Materials

Studies were made on 30 cases of benign skin lesions (atheroma 3, nevo celluler nevus 5, lipoma 4, hemangioma 4, granuloma telangiectaticum 4, seborrheic keratosis 5, hemangiolipoma 1, neurilemmoma 2, eccrine poroma 2) and 32 cases of malignancy (squamous cell carcinoma 8, skin metastasis of squamous cell carcinoma 2, basal cell carcinoma 8, malignant melanoma 7, skin metastasis of malignant...
showed as an evenly shaded green (Fig. 2).

In contrast, most of the malignant tumors (30/32 tumors) were classified as higher than pattern 3.

A case of basal cell carcinoma showed as pattern 3 (Fig. 3). Since this tumor had a Bactrian camel-like shape, pressure did not depend on uniformity. It was judged to possibly be pattern 4. One patient had skin tumors of different

<table>
<thead>
<tr>
<th>Elastography pattern</th>
<th>No. of lesions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>26 Benign</td>
</tr>
<tr>
<td>2</td>
<td>4 Benign</td>
</tr>
<tr>
<td>3</td>
<td>0 Benign</td>
</tr>
<tr>
<td>4</td>
<td>0 Benign</td>
</tr>
<tr>
<td>5</td>
<td>0 Benign</td>
</tr>
</tbody>
</table>

Table 1: Comparison of Elastography pattern and pathological findings

Fig. 2: A neurilemmoma of the left foot
The Elastography imaging is showed pattern 1. In Elastography, red is artifact.

Fig. 3: A basal cell carcinoma of the outer corner of the left eye
The Elastography imaging is showed pattern 4.
pathological forms (Fig. 4a). A squamous cell carcinoma showed as blue (Fig. 4b) and a seborrheic keratosis that was a benign lesion showed as evenly green (Fig. 4c). A malignant melanoma showed as pattern 3, although it was a very thin tumor (Fig. 5).

In malignant tumors, as for those which were pattern 2, one was a big tumor 3.2 cm wide (Fig. 6) and another was located on the tip of the nose (Fig. 7).

Fig. 5: A malignant melanoma of finger
The Elastography imaging is showed pattern 3.
(Tumor thickness 0.6 mm)

Fig. 6: A squamous cell carcinoma of head
The Elastography imaging is showed pattern 2.
(Tumor size is 32 x 30 mm.)

Fig. 7: A basal cell carcinoma of the top of nose
In Elastography, transversal scanning image and longitudinal image both are showed pattern 2.
5. Discussion

Real-time Tissue Elastography is a non-invasive method in which stiffness or strain images of soft tissue are used to detect or classify tumors. However, when we use Elastography on skin tumors, there are some points that require careful attention. It is necessary to change the method of compression in cases where tumors exist in the skin surface, and cases where they exist in subcutaneous parts. When we examine a tumor on a finger-tip or the tip of the nose, particular attention is required. As in cases like that in Fig. 7, even with a malignant tumor that shows as pattern 2, it is very interesting to note that changing the scanning direction results in changes in the composition of the green and blue mosaic. In this study, Elastography imaging patterns of the skin tumors we detected were similar to the patterns of breast tumors. It is thought that we can diagnose tumors which showed pattern 3, 4 or 5 as malignant. Even if it is a considerably thin malignant tumor, it is recognized as tumor which is hard in Elastography imaging, but on the other hand, a large tumor of more than 3 cm tends to be depicted as a soft tumor. When the size of a malignant tumor increases, elasticity changes. It is thought that this change of elasticity reflects tissue structure and it may indicate that a pathological organization should be anticipated.

Because there are many kinds of skin disease, it will be necessary to accumulate more data in the future. The development of a special transducer for skin tumors is also expected. If the level of skill improves, Elastography will be useful to judge whether a skin tumor is benign or malignant.

6. Conclusion

Elastography is useful and is a possible new method in ultrasound diagnosis of skin tumors.

References