Clinical value of ultrasonic elastography in diagnosing thyroid carcinoma.

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Abstract

Objective: This study aims to explore the clinical value of ultrasonic elastography in diagnosing thyroid carcinoma.

Methods: Eighty thyroid carcinoma patients (100 nodules) admitted to a hospital were enrolled in this research. Routine ultrasonic testing and elastography were administered to all patients. The color and condition (benign or malignant) of the nodules were determined. The results were compared with pathogenic diagnosis of the operation. The specificity, sensitivity, and accuracy of the two test methods were computed and statistically compared.

Results: Pathological diagnosis of the operation suggested that among the 100 nodules, 70 were benign and 30 were malignant. The specificity, sensitivity, and accuracy of the routine ultrasonic check diagnosis were 50.00%, 53.33%, and 51.00%, respectively, whereas those of the ultrasonic elastography were 92.86%, 96.67% and 94.00%, respectively. The former was significantly (P<0.05) higher than the latter in all parameters.

Conclusion: Ultrasonic elastography showed a significantly higher critical value in diagnosing thyroid carcinoma and could accurately identify nodules as either benign or malignant. Hence, ultrasonic elastography is worth further critical promotion and application.

Keywords: Thyroid carcinoma, Ultrasonic elastography, Benign and malignant nodules, Clinical value.
and red signifies the hardness of tissues smaller the average hardness. Two experienced physicians carried out the joint survey to guarantee accuracy and effectiveness of the test.

**Observational indexes**

The color of the focus was observed to determine whether a nodule was benign or malignant. The observation results were compared with the pathological diagnosis to calculate the specificity, sensitivity, and accuracy of the two test methods. The test results were then statistically compared.

A grade system was devised in identifying the focus and tissue color in the ultrasonic elastography: grade 0, blue, red, green, or blue and red; grade I, green; grade II, blue; grade III, blue and green; and grade IV, blue. The elasticity of benign nodules ranged from grade 0 to grade II, whereas that of malignant nodules ranged from grade III to grade IV.

**Statistical processing**

Parameters (specificity, sensitivity, and accuracy) of the methods were analysed using SPSS 22.0 and were expressed in percentages. Pearson’s chi-square test ($\chi^2$ test) was performed, and statistically significant difference was considered at $P<0.05$.

**Results**

**Pathogenic diagnosis results**

Pathological diagnosis suggested that, among 100 nodules, 70 (70%) were benign and 30 (30%) were malignant.

**Specificity, sensitivity, and accuracy of the ultrasonic elastography**

As shown in Table 1, the routine ultrasonic testing achieved a specificity of 50.00% (35/70), a sensitivity of 53.33% (16/30), and an accuracy of 51.00% (51/100).

<table>
<thead>
<tr>
<th>Pathological diagnosis</th>
<th>Routine ultrasonic testing</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benign</td>
<td>35</td>
<td>70</td>
</tr>
<tr>
<td>Malignant</td>
<td>14</td>
<td>30</td>
</tr>
<tr>
<td>Total</td>
<td>49</td>
<td>100</td>
</tr>
</tbody>
</table>

**Ultrasonic elastography diagnosis results**

In ultrasonic elastography (Table 2), 66 out of 100 (66%) nodules were benign, and 34 (34%) were malignant nodules.

**Specificity, sensitivity, and accuracy of ultrasonic elastography**

Ultrasonic elastography (Table 3) obtained a specificity of 92.86% (65/70), a sensitivity of 96.67% (29/30), and an accuracy of 94.00% (94/100).

<table>
<thead>
<tr>
<th>Pathogenic diagnosis</th>
<th>Routine ultrasonic testing</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benign</td>
<td>65</td>
<td>70</td>
</tr>
<tr>
<td>Malignant</td>
<td>1</td>
<td>30</td>
</tr>
<tr>
<td>Total</td>
<td>66</td>
<td>100</td>
</tr>
</tbody>
</table>

**Comparison of routine ultrasonic and ultrasonic elastography testing results**

As shown in Table 4, the specificity, sensitivity, and accuracy of ultrasonic elastography diagnosis results were significantly higher than those of the routine ultrasonic testing ($P<0.05$).

<table>
<thead>
<tr>
<th>Test method</th>
<th>Specificity</th>
<th>Sensitivity</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Routine ultrasonic testing</td>
<td>50.00% (35/70)</td>
<td>53.33% (16/30)</td>
<td>51.00 (51/100)</td>
</tr>
<tr>
<td>Ultrasonic elastography</td>
<td>92.86% (65/70)</td>
<td>96.67% (29/30)</td>
<td>94.00 (94/100)</td>
</tr>
</tbody>
</table>

**Discussion**

Ultrasonic elastography is a type of ultrasonoscopy reflecting lesion elastic information before and after imposition of an external force. After an external force is exerted on the tissues, the normal soft tissues undergo a higher degree of deformation as compared with the hard tissues [5]. Lesion changes before and after an external force is exerted, which shows the degree of lesion hardness. Lesion hardness is regarded as one of major parameters to evaluate the nature of lesion. For example, low-echo lesion diagnosis is a difficult but high-elasticity procedure; this method can be used in the diagnosis of adipose tissues [6]. Conversely, ultrasonic elastography provides elasticity information of biological tissues for accurate
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evaluation of diseases. Different tissues have varying elasticity coefficients. When an external force is imposed or an alternating vibration occurs, tissues are changed morphologically. During testing, signals of the tested body in different periods of time are collected and analysed using autocorrelation [7]. Gray-scale imaging or color-coding imaging is then carried out. If the imposed external force is the same as before, then the higher the elasticity coefficient is, the smaller the morphological change will be. On the contrary, the smaller the elasticity coefficient is, the larger the morphological change will be. This generalization suggests that deformation of normal soft tissues is much more significant than that of hard tumor tissues [8]. Ultrasonic elastography aims to generate different morphological changes based on differences between the tumor or lesion area and the surrounding normal tissues in terms of the elasticity coefficient. Meanwhile, color coding is adopted to show such morphological changes, thereby enabling judgment of elasticity of lesion tissues and prediction of potential lesions.

Thyroid cancer is a clinically common disease whose morbidity has increased in recent years [9]. Pathogenesis of thyroid cancer is often unobvious and can be divided into benign and malignant lesions. Immediate and early discovery, diagnosis, and identification of thyroid cancer can provide reliable references for clinical treatment and rehabilitation of patients with this disease. The routine ultrasonic testing is the top choice for thyroid cancer, where in the lesion undergoes 2D gray-scale ultrasonic testing and Doppler color ultrasonic diagnosis. Despite its low specificity, sensitivity, and accuracy, 2D gray-scale ultrasonic testing remains an effective evaluation tool in determining benign and malignant thyroid lesions [10]. However, ultrasonic elastography has emerged as a new diagnosis approach. This method’s judgment of the hardness of relevant tissues, including thyroid glands, can help diagnose the condition (benign or malignant) of tissues. Furthermore, the diagnostic specificity, sensitivity, and accuracy of this procedure are high, which can fully compensate the shortage of the routine ultrasonic testing of commonly-seen diseases.

Results suggested that the specificity, sensitivity, and accuracy of the routine ultrasonic testing were 50.00%, 55.56%, and 51.43%, respectively, whereas those of ultrasonic elastography were 92.86%, 96.67%, and 94.00%, respectively. The latter was significantly higher (P<0.05) than the former in all parameters. These findings highly coincide with the research of Gao, who reported the same percentages in all categories for routine ultrasonic testing. However, these percentages are significantly lower than those of ultrasonic elastography, with 92.31%, 100.00%, and 94.28%, respectively. Similarly, the latter was significantly higher (P<0.05) than the former. This comparative analysis indicates that ultrasonic elastography could better diagnose thyroid cancer, with a higher specificity, sensitivity, and accuracy, as compared with the routine ultrasonic testing. Overall, ultrasonic elastography could accurately identify and diagnose whether thyroid nodules are benign or malignant and could provide reliable references for clinical diagnosis and treatment.

Conclusion

Ultrasonic elastography has a higher clinical value in diagnosing thyroid cancer and can accurately identify benign and malignant nodules. Thus, ultrasonic elastography is worth further promotion and application.

References


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