Can Abdominal CT Features Predict Autonomous Cortisol Secretion in Patients with Adrenal Nodules?

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Introduction

Adrenal nodules are incidentally discovered in 5% of patients undergoing abdominal CTS. It is estimated that 5-10% of these adrenal incidentalomas have subclinical autonomous secretion of cortisol, termed mild autonomous cortisol secretion (MACS).

The purpose of this study is to determine if CT features of these adrenal nodules and other abdominal CT findings could predict autonomous cortisol secretion, and to identify a nodule size threshold below which MACS is unlikely.

Methods

This was a retrospective study with patients who had a serum cortisol test within 1 year of CT abdomen showing an adrenal nodule. Patients were considered to have no MACS if serum cortisol was ≤ 1.8 µg/dL after the 1-mg dexamethasone suppression test. To have possible or definite MACS if serum cortisol was > 1.8 µg/dL after the 1-mg dexamethasone suppression test. The following CT features were assessed: nodule length and width, unenhanced nodule attenuation, contralateral adrenal gland thickness, liver attenuation, psoas muscle thickness, and visceral adipose tissue were not significantly correlated with cortisol secretion.

Using a threshold nodule length of 1.5 cm, the sensitivity and specificity for predicting possible or definite autonomous cortisol secretion was 93.1% and 37.9% respectively.

Results

29 patients had no autonomous cortisol secretion, and 29 patients had possible/definite autonomous cortisol secretion. Nodule length and width were the only two variables that significantly differed between patients with nonfunctional nodules and those with possibly or definitively functional nodules. Contralateral adrenal gland thickness, liver attenuation, psoas muscle thickness, and visceral adipose tissue were not significantly correlated with cortisol secretion.

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Conclusion

Autonomous cortisol secretion in patients with adrenal nodules correlates with increasing nodule size. A nodule length threshold of 1.5 cm provides 93.1% sensitivity for predicting possible or definite MACS based on the 1-mg Dexamethasone suppression test.

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Discussion

Our study confirms the correlation between adrenal nodule size and autonomous cortisol secretion. Our study is unique in that we present a single, easy-to-obtain measurement of the maximum nodule diameter that can predict autonomous cortisol secretion with high sensitivity. Adrenal nodule size may help identify patients who are highly unlikely to have MACS, potentially obviating the need for hormonal evaluation.

Table 1. Univariate Regression analysis of CT features and serum cortisol level after Dexamethasone suppression test.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Cortisol &gt; 1.8 µg/dL (n=29)</th>
<th>Cortisol ≤ 1.8 µg/dL (n=29)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nodule length (cm)</td>
<td>2.5</td>
<td>2.5</td>
<td>1.6</td>
</tr>
<tr>
<td>Nodule width (cm)</td>
<td>1.8</td>
<td>1.5</td>
<td>1.3</td>
</tr>
<tr>
<td>Nodule unenhanced attenuation (HU)</td>
<td>12.6</td>
<td>6</td>
<td>7.7</td>
</tr>
<tr>
<td>Contralateral gland mean limb thickness (cm)</td>
<td>0.36</td>
<td>0.37</td>
<td>0.37</td>
</tr>
<tr>
<td>VAT (cm²)</td>
<td>225.4</td>
<td>201</td>
<td>217.6</td>
</tr>
<tr>
<td>SAT (cm²)</td>
<td>292.0</td>
<td>275</td>
<td>313.2</td>
</tr>
<tr>
<td>Mean psoas area (cm²)</td>
<td>6.4</td>
<td>6.2</td>
<td>7.4</td>
</tr>
<tr>
<td>Psoas density (HU)</td>
<td>43.7</td>
<td>41.4</td>
<td>45.0</td>
</tr>
<tr>
<td>Unenhanced liver attenuation (HU)</td>
<td>41.2</td>
<td>48</td>
<td>51.0</td>
</tr>
</tbody>
</table>

Area Under the Curve = 0.7889

Axial CT showing 2.8 cm right adrenal nodule (arrow) in a patient with MACS

Receiver operator characteristic curve for adrenal nodule length in predicting serum cortisol > 1.8 µg/dL after dexamethasone suppression test.