High incidence of isolated subsegmental pulmonary emboli on multi-slice spiral CT: A comparative clinical study

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Dear Sir,

Spiral computed tomography (CT) of the pulmonary arteries has now generally become accepted as a reliable first-line diagnostic test for pulmonary embolism (PE) (1). But not every spiral CT is the same. Both single-slice and multi-slice CT have proved reliable in diagnosing PE (1, 2), but single-slice CT, which uses up to five-times thicker imaging sections, may miss smaller PE (3) that are readily detected with multi-slice CT. Consequently, with multi-slice CT one will identify more individuals with isolated small PE than with single-slice CT. We wanted to assess the magnitude of this effect.

We retrospectively determined the prevalence of isolated small subsegmental PE (ISSPE) in two separate groups of consecutive in- and outpatients who had undergone spiral CT of the pulmonary arteries for suspected PE, with single-slice CT (n = 510) and multi-slice CT (n = 356), respectively. Previously, we have reported on the single-slice CT patients group in a multicenter study (4). These patients were examined on a single-slice CT system using 5-mm thick imaging sections. The multi-slice CT group was studied in a single center on a 4-slice CT scanner using 1-mm thick sections. In both groups, a 150 ml bolus of non-ionic contrast agent was injected in an antecubital vein at a flow rate of 4 ml/s. Reading and scoring of CT for PE in both groups had been done by radiologists in the clinical setting according to standard criteria (5). For the purpose of the present analysis, the CT-scans positive for PE were retrieved and evaluated for the presence of ISSPE according to established definitions (6). Differences between proportions were tested for statistical significance by using the Chi²-test at p<0.05.

The proportion of ISSPE relative to all PE was significantly larger in multi-slice CT (21/96, 21.9%; 95% CI: 9.75% – 42.05%) than in single-slice CT (2/121, 1.7%; 95% CI: 4.54% – 9.73%), p < 0.001.

The proportion of patients with all PE was slightly higher in the multi-slice than in the single-slice CT group, 103/356 (28.9%, 95% CI: 23.4% – 35.1%) versus 124/510 (24.3%, 95% CI: 19.4% – 29.5%), but this difference was not significant. (For analysis, the CT scans of three and seven patients, respectively, could not be retrieved in the single-slice and multi-slice CT groups.)

The results are consistent with the previous data in the literature on ISSPE (2, 7–12) (see Table 1). In general, more small PE were seen with multi-slice CT than with single-slice CT, with a single outlier study of a relatively low incidence of 8.5% of ISSPE found with multi-slice CT by Perrier et al. (2). The explanation for this difference is in the better spatial resolution along the vertical axis and better image quality provided by the use of thinner imaging sections in multi-slice CT (13, 14). It is of note that one does not expect to find differences in ISSPE among the various commercially available 4-, 16- and 64-detector multi-slice CT systems, because these all employ similar 0.8 – 1 mm thick imaging sections.

There are obvious limitations of our analysis. The patient data were from two non-randomized historical cohorts, one from a multicenter study and one from a single center study. In fact, referral patterns may differ from institution to institution and also over time.

Our present results and the results from literature strongly suggest that more ISSPE will be detected with multi-slice CT than with single-slice CT. Thus, one should be aware that by using multi-slice CT, many more patients will be labeled as having PE. This raises the issue, also put forward by others (15), how clinically relevant ISSPE is, i.e. whether ISSPE should be treated with anticoagulant treatment, which in itself poses risks of mortality and morbidity.

Table 1: Prevalence of pulmonary emboli (PE) and isolated subsegmental pulmonary emboli in relation to the use of angiography (A), single-slice CT (SSCT) or multi-slice CT (MSCT) as diagnostic tool. a Chronic PE included. The total amount of PE in the ‘PE’ column may differ from the ‘ISSPE’ column because of mainly technical reasons mentioned in the articles.

<table>
<thead>
<tr>
<th>A</th>
<th>SSCT</th>
<th>MSCT</th>
<th>PE</th>
<th>ISSPE</th>
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</thead>
<tbody>
<tr>
<td>Eyer et al.</td>
<td>1</td>
<td>316/1435 (22.0%)</td>
<td>377/276 (27.9%)</td>
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<tr>
<td>Perrier et al.</td>
<td>1</td>
<td>194/756 (25.7%)</td>
<td>16/210 (8.5%)</td>
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<tr>
<td>Current study</td>
<td>1</td>
<td>103/356 (28.9%)</td>
<td>21/96 (21.9%)</td>
<td></td>
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<tr>
<td>Current study</td>
<td>1</td>
<td>124/510 (24.3%)</td>
<td>2/121 (1.7%)</td>
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<tr>
<td>Muss et al.</td>
<td>1</td>
<td>360/1041 (34.6%)</td>
<td>12/360 (3.3%)</td>
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<tr>
<td>de Monye et al.</td>
<td>1</td>
<td>130/487 (26.7%)</td>
<td>29/130 (22.3%)</td>
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<tr>
<td>Oser et al.</td>
<td>1</td>
<td>-</td>
<td>23/76 (30.3%)</td>
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<tr>
<td>Diffie et al.</td>
<td>1</td>
<td>34/125 (27.2%)</td>
<td>5/34 (14.3%)</td>
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<tr>
<td>Stein et al. (PIOPED)</td>
<td>1</td>
<td>383/1099 (34.8%)</td>
<td>22/375 (5.8%)</td>
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References


