Pulmonary Tuberculosis in Patients with Emphysema: CT Findings

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Purpose

Introduction

• #Tuberculosis (TB) is one of major public health issues worldwide. According to the World Health Organization, there were about 8.8 million incident cases of TB globally in 2010, and 1.1 million deaths among HIV-negative cases and 0.35 million deaths among HIV-positive cases.
• #TB can occur in any organs but primarily affects the lungs. Pulmonary TB often shows atypical imaging findings in elderly and those with pre-existing pulmonary diseases.
• #Chronic obstructive pulmonary disease (COPD), defined by limitation of expiratory airflow, is a major leading cause of mortality and morbidity. COPD is clinical diagnosis and is consists of heterogenous conditions; However, emphysema, a major part of COPD, can be reliably diagnosed on imaging study such as HRCT.
• #Emphysema is a prevalent co-morbid condition with TB. However, to the best of our knowledge, rarely is reported about imaging findings of pulmonary TB in patients with emphysema.

Purpose

• #The purpose of this study was to evaluate retrospectively the CT findings of active pulmonary TB in patients with emphysema.

Methods and Materials

Patients enrollment

Emphysema group

• #39 patients out of 330 consecutive COPD patients with active pulmonary TB
• #M: F = 36: 3; mean age, 64.8 years
• #Available chest CT scans and emphysema on chest CT
• #FEV1/FVC < 0.7 & FEV1 < 80% (predicted)

Non-Emphysema group
• #57 age- and sex-matched pulmonary TB patients without COPD
• #Available chest CT scans and no emphysema on chest CT
• #M: F = 46: 11; mean age, 63.3 years
• #FEV1/FVC > 0.7 & FEV1 > 80% (predicted)

Comparison between two groups

Symptoms and signs
• Fever, hemoptysis, cough, sputum, dyspnea
• Complication of TB treatment

Laboratory findings
• WBC, CRP, ESR, Albumin, Hb, Glucose
• Drug sensitivity, Positivity of smear for AFB

CT findings
• the location of the main lesion [upper lung vs. middle and lower lung]
• the presence and pattern of consolidation
• the presence of GGO, nodules/masses, centrilobular nodules, tree-in-bud appearance, septal thickening, cavity, pleural effusion, lymphadenopathy, extrapulmonary involvement and old TB scar

Statistical analysis
• The variables were compared between the two groups with Mann-Whitney U tests for numerical values and Fisher exact tests for categorical values. Statistical analysis was performed using statistics software (SPSS version 11.0, SPSS). Significant difference was considered to be a p-value of less than 0.05.

Results

Demographic and Lab findings of patients with pulmonary tuberculosis in emphysema group and non-emphysma group.

• PaO2, PaCO2 and FEV1/FVC values were significantly different between two groups.
### Clinical symptoms and history of patients with pulmonary tuberculosis in emphysema and non-emphysema group.

- Fever was more frequent (p = 0.04) and CRP was significantly increased (p =0.002) in the emphysema group.

<table>
<thead>
<tr>
<th>Clinical Sx &amp; Hx</th>
<th>Emphysema group</th>
<th>Non-emphysema group</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever</td>
<td>13(36)</td>
<td>9(16)</td>
<td>0.043*</td>
</tr>
<tr>
<td>Cough</td>
<td>17(47)</td>
<td>33(58)</td>
<td>0.394</td>
</tr>
<tr>
<td>Sputum</td>
<td>11(31)</td>
<td>25(44)</td>
<td>0.275</td>
</tr>
<tr>
<td>Dyspnea</td>
<td>15(42)</td>
<td>20(35)</td>
<td>0.661</td>
</tr>
<tr>
<td>Hemoptysis</td>
<td>1(3)</td>
<td>4(7)</td>
<td>0.645</td>
</tr>
<tr>
<td>AFP smear (+)</td>
<td>14</td>
<td>29</td>
<td>0.210</td>
</tr>
<tr>
<td>Resistant to durg sensitivity test</td>
<td>17:1</td>
<td>50:7</td>
<td>0.671</td>
</tr>
<tr>
<td>Cx of TB treatment</td>
<td>3(15)</td>
<td>11(19)</td>
<td>1.000</td>
</tr>
<tr>
<td>Co-existing disease</td>
<td>19(49)</td>
<td>16(28)</td>
<td>0.085</td>
</tr>
</tbody>
</table>
Radiologic findings of patients with pulmonary tuberculosis in emphysema and non-emphysema group.

- Among CT findings, consolidation and GGO were more frequently seen in the emphysema group (82% and 69% vs. 42% and 19%) (p < 0.001). Consolidation was more often non-segmental than segmental in the emphysema group. Tree-in-bud appearance was more frequently seen in the non-emphysema group (79% vs. 36%) (p < 0.001). Other CT findings including the location of main lesion and the rate of positive smear for AFB were not significantly different between two groups.

<table>
<thead>
<tr>
<th>Radiologic findings</th>
<th>Emphysema group</th>
<th>Non-emphysema group</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consolidation</td>
<td>32 (82)</td>
<td>23 (42)</td>
<td>&lt; 0.001*</td>
</tr>
<tr>
<td>segmental</td>
<td>8 (25)</td>
<td>11 (48)</td>
<td></td>
</tr>
<tr>
<td>nonsegmental</td>
<td>24 (75)</td>
<td>12 (52)</td>
<td></td>
</tr>
<tr>
<td>GGO</td>
<td>27 (69)</td>
<td>11 (19)</td>
<td>&lt; 0.001*</td>
</tr>
<tr>
<td>Nodules or Mass</td>
<td>27 (69)</td>
<td>42 (74)</td>
<td>0.651</td>
</tr>
<tr>
<td>Centrilobular nodules</td>
<td>24 (62)</td>
<td>43 (75)</td>
<td>0.177</td>
</tr>
<tr>
<td>Tree-in-bud</td>
<td>14 (36)</td>
<td>45 (79)</td>
<td>&lt; 0.001*</td>
</tr>
<tr>
<td>Septal thickening</td>
<td>6 (15)</td>
<td>4 (7)</td>
<td>0.307</td>
</tr>
<tr>
<td>Cavity</td>
<td>16 (41)</td>
<td>29 (51)</td>
<td>0.407</td>
</tr>
<tr>
<td>Pleural effusion</td>
<td>10 (26)</td>
<td>17 (30)</td>
<td>0.818</td>
</tr>
<tr>
<td>Extrapulmonary</td>
<td>1 (3)</td>
<td>2 (4)</td>
<td>1.000</td>
</tr>
<tr>
<td>involvement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lymphadenopathy</td>
<td>16 (41)</td>
<td>18 (32)</td>
<td>0.389</td>
</tr>
<tr>
<td>Old TB scar</td>
<td>10 (26)</td>
<td>7 (12)</td>
<td>0.108</td>
</tr>
</tbody>
</table>

Note. Data are numbers of patients; numbers in parentheses are percentages.

* Significant difference was considered to be a p-value of less than 0.05.
Fig. 1: A 52-year-old male presented with dyspnea and fever (emphysema group). (a) Enhanced chest CT, (b) HRCT shows nonsegmental consolidation and GGO with interlobular septal thickening in right lower lobe. CRP was increased (232) and clinical impression was COPD with pneumonia. Sputum smear for AFB was positive, and sputum culture showed growth of M. Tuberculosis.

References: Radiology, Gyeongsang National University Hospital - Jinju/KR

Fig. 2: A 74-year-old male presented with cough (emphysema group). (a) Enhanced chest CT, (b) HRCT shows nonsegmental consolidation in right upper lobe. Note fluid collection in emphysematous lung. Sputum smear for AFB was strongly positive, and sputum culture showed growth of M. Tuberculosis.

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Fig. 3: A 52-year-old COPD patient presented with aggravated dyspnea (emphysema group). (a) HRCT shows nonsegmental consolidation with GGO in left upper lobe. Note underlying emphysema. (b) There are nodules and segmental consolidation in LUL anterior segment and centrilobular nodules with tree-in-bud appearance in lingular division and LLL superior segment. Sputum smear for AFB was negative, but sputum culture showed growth of M. tuberculosis.

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Fig. 4: A 64-year-old COPD patient presented with fever, cough and sputum. (emphysema group). (a) HRCT in both upper lobes shows cavity, nodules and centrilobular nodules with tree-in-bud appearance. (b) There is nonsegmental consolidation in left lower lobe. Sputum smear for AFB was strongly positive, and sputum culture showed growth of M. Tuberculosis.

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Fig. 5: A 45-year old male COPD patient presented with dyspnea (emphysema group). (a) HRCT shows cavities in right upper lobe and centrilobular nodules with tree-in-bud appearance in left upper lobe. (b) There shows clustered centrilobular nodules with tree-in-bud appearance in both lower lobes. Sputum smear for AFB was strongly positive and sputum culture showed growth of M. Tuberculosis.

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Images for this section:

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Conclusion

• CT findings of pulmonary TB in emphysema patients often showed nonsegmental consolidation with GGO and lack of bronchogenic spread. With clinical symptoms of fever and high CRP, pulmonary TB can be mistaken for community-acquired pneumonia in emphysema patients.

• To avoid making misdiagnosis, we recommend that any pneumonia in emphysema patient not resolving after empirical treatment should be investigated for Mycobacterium tuberculosis.

References


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