Measurement of airway inflammation in smokers by means of positron emission tomography

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Disclosure

The authors have no financial interest to declare in relation to the content in this presentation.
High uptake of $^{18}$FDG in infectious/inflammatory lesions

Tuberculosis
High uptake of $^{18}$FDG in infectious/inflammatory lesions

Sarcoidosis

Steroid treatment

Before

After

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NUMEMA
Nuclear Medicine in Malmö
Purpose

To evaluate whether there is any differences in the $^{18}$FDG-uptake in current smoker and never-smoker
Material

Inclusion criteria

Patients undergoing $^{18}$FDG-PET/CT for staging of cancer
No region of increased lung density on CT
No localised high uptake of $^{18}$FDG
Material

Exclusion criteria

- Cardiovascular disease,
- Diabetes mellitus
- Vasculitis
- Inflammatory arthritis
- Renal impairment
- Glucocorticoids, or anti-inflammatory therapies.
- Localised uptake of $^{18}$FDG in the lungs were excluded.
- Interstitial lung disease
## Patient characteristics

<table>
<thead>
<tr>
<th></th>
<th>Never-smokers</th>
<th>Smokers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>N</strong></td>
<td>23</td>
<td>22</td>
</tr>
<tr>
<td>Gender (M/F)</td>
<td>11/12</td>
<td>12/10</td>
</tr>
<tr>
<td>Age (y)</td>
<td>60.7 ± 13.6</td>
<td>65.2 ± 10.3</td>
</tr>
<tr>
<td>Current smoking (cigarettes/day)</td>
<td>0</td>
<td>17 ± 5</td>
</tr>
<tr>
<td>Total smoking (pack years)</td>
<td>0</td>
<td>41 ± 16</td>
</tr>
</tbody>
</table>

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Methods

Procedure

Measurement of blood glucose.
Injection of $^{18}$FDG, 4 MBq/kg, $\leq$ 400 MBq.
Uptake time approx. 60 min.
Contrast enhanced CT, low dose CT for attenuation correction.
Imaging from the base of the skull to the thighs.
Standardized uptake value, SUV

\[ \text{SUV} = \frac{\text{tissue concentration (kBq/mL)}}{\text{injected activity/body weight (kBq/g)}} \]

To be representative for lung tissue, the SUV measured must be divided by lung density.
Conventional calculation of SUV not appropriate for the lung

Density of normal lung tissue 0.3 g/ml
SUV is dependent on lung inflation declining with increased lung volume
Semi-automatic software

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Semi-automated Analysis of SUV
## Results

<table>
<thead>
<tr>
<th></th>
<th>Never-smokers</th>
<th>Smokers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood glucose (mmol/L)</td>
<td>5.9 ± 1.0</td>
<td>6.6 ± 1.1</td>
</tr>
<tr>
<td>Uptake time (min)</td>
<td>68 ± 13</td>
<td>72 ± 10</td>
</tr>
<tr>
<td>$SUV_{\text{blood}}$</td>
<td>1.68 ± 0.21</td>
<td>1.61 ± 0.24</td>
</tr>
<tr>
<td>$SUV_{\text{lung}}$</td>
<td>0.49 ± 0.10</td>
<td>0.49 ± 0.11</td>
</tr>
<tr>
<td>DL (HU)</td>
<td>-750 ± 50</td>
<td>-772 ± 56</td>
</tr>
<tr>
<td>$SUV_{\text{lung}} / DL$</td>
<td>1.84 ± 0.20</td>
<td>2.00 ± 0.21 p&lt;0.05</td>
</tr>
</tbody>
</table>
$^{18}$FDG uptake corrected for lung density

<table>
<thead>
<tr>
<th>Smoking status</th>
<th>Mean±SE</th>
<th>Mean±1.96*SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-smoker</td>
<td>1.90</td>
<td>1.85</td>
</tr>
<tr>
<td>Smoker</td>
<td>1.95</td>
<td>1.90</td>
</tr>
</tbody>
</table>

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Study limitations

Presence of cancer and the underlying disease may affect the glucose uptake in the lungs e.g. by the presence of micrometastases.

No information about lung function.
Conclusion

$^{18}$FDG uptake is higher in peripheral lung in smokers than in never-smokers. This may reflect inflammation in small airways and alveoli.

$^{18}$FDG-PET/CT may offer a means of studying lung inflammation in smokers at a group level.
Thank you for your attention!