Prone position PET/CT is useful in reducing gravity-dependent opacity related $[^{18}\text{F}]$fluorodeoxyglucose uptake

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Research Article

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Abstract

Purpose

We investigated whether $^{18}$F-fluorodeoxyglucose ($^{18}$FDG) positron emission tomography/computed tomography (PET/CT) taken in the prone position could reduce $^{18}$FDG uptake in dependent lungs.

Methods

Patients who underwent $^{18}$FDG PET/CT in both supine and prone positions from October 2018 to September 2021 were reviewed retrospectively. $^{18}$FDG uptake of dependent and nondependent lungs was analysed visually and semi-quantitatively. A linear regression analysis was also performed to examine the association between the mean standardised uptake value ($\text{SUV}_{\text{mean}}$) and the Hounsfield unit (HU).

Results

Totally, 135 patients (median age, 66 years [interquartile range: 58–75 years]; 80 men) were included. Dependent lungs showed significantly higher $\text{SUV}_{\text{mean}}$ and HU than nondependent lungs on both supine position PET/CT (sPET/CT, 0.59 ± 0.14 vs. 0.36 ± 0.09, $p < 0.001$; −671 ± 66 vs. −802 ± 43, $p < 0.001$; respectively) and prone position PET/CT (pPET/CT, 0.45 ± 0.12 vs. 0.42 ± 0.08, $p < 0.001$; −731 ± 67 vs. −790 ± 40, $p < 0.001$; respectively). In the linear regression analysis, there was a strong association between the $\text{SUV}_{\text{mean}}$ and HU in sPET/CT ($R = 0.86$, $p < 0.001$) and a moderate association in pPET/CT ($R = 0.65$, $p < 0.001$). One hundred and fifteen patients (85.2%) had visually discernible $^{18}$FDG uptake in the posterior lung on sPET/CT, which disappeared on pPET/CT in all but one patient (0.7%, $p < 0.001$).

Conclusion

$^{18}$FDG uptake of the lung had moderate-to-strong associations with HU. Gravity-dependent opacity-related $^{18}$FDG uptake can be effectively reduced on prone position PET/CT.

Introduction

Dependent opacity on computed tomography (CT) is an ill-defined increased subpleural attenuation that occurs in the dependent lungs and disappears when the region becomes nondependent [1]. Dependent opacity can be caused by passive microatelectasis or by fluid accumulation due to gravity [2]. Therefore, when imaging is performed in the supine position, gravity-dependent opacity often occurs in the posterior lung affected by gravity.
Not only gravity-dependent opacity but also high $[^{18}\text{F}]$fluorodeoxyglucose ($[^{18}\text{F}]$FDG) uptake can be seen in the dependent lungs on positron emission tomography/computed tomography (PET/CT). According to Gerbaudo et al., gravity-dependent opacity or atelectasis showed higher $[^{18}\text{F}]$FDG uptake than the normal lung, and there was a positive linear correlation between atelectatic lung density and $[^{18}\text{F}]$FDG uptake [3]. Though most atelectasis showed a lower mean standardised uptake value (SUV$_{\text{mean}}$) than malignancy [3], there is an overlap between atelectasis and tumours with low $[^{18}\text{F}]$FDG uptake, such as small-sized tumours, lepidic-dominant adenocarcinoma, and neuroendocrine tumours [4, 5]. Therefore, assessments of $[^{18}\text{F}]$FDG uptake may be difficult when these types of lung nodules are located within the gravity-dependent opacity. In addition, gravity-dependent opacity can be a confounding factor in quantifying lung inflammation parameters such as the metabolic lung volume or total lung glycolysis on $[^{18}\text{F}]$FDG PET/CT [6, 7].

CT scans usually obtain images in the supine position; however, CT taken in the prone position helps differentiate between gravity-dependent opacity and true lung disease [8, 9]. However, it is not known whether $[^{18}\text{F}]$FDG uptake in the dependent lung would be reduced when $[^{18}\text{F}]$FDG PET/CT is taken in the prone position. Therefore, we investigated whether $[^{18}\text{F}]$FDG PET/CT taken in the prone position could reduce $[^{18}\text{F}]$FDG uptake in dependent lungs.

**Materials And Methods**

**Subjects**

In our institution, some of the patients with lung or liver lesions underwent an additional regional prone position PET/CT (pPET/CT) immediately after the routine torso supine position PET/CT (sPET/CT) because pPET/CT is useful in reducing respiratory motion artefacts caused by diaphragmatic movement [10]. We retrospectively reviewed 197 patients who underwent $[^{18}\text{F}]$FDG PET/CT in both supine and prone positions from October 2018 to September 2021 in our institution. This study was approved by the Institutional Review Board of our institution (IRB no. 2022-02-017). As a retrospective study, informed consent was waived. Combined lung pathologies, which can affect the measurement of SUV$_{\text{mean}}$ or Hounsfield unit (HU) of a region of interest (ROI), were demonstrated in terms of nodules or masses, pleural effusion, interstitial lung disease, pneumonia or airway disease resulting in mosaic lung parenchymal attenuation, and consolidative lesions. Sixty-two patients were excluded due to these confounding factors (Fig. 1).

Each patient’s age, sex, smoking history, smoking duration, reason for undergoing $[^{18}\text{F}]$FDG PET/CT, and present illness were obtained through electronic medical records.

**PET/CT imaging protocol**

$[^{18}\text{F}]$FDG PET/CT image acquisition conditions were as follows: The patient fasted for $> 6$ h before $[^{18}\text{F}]$FDG PET/CT and was injected with $[^{18}\text{F}]$FDG at 5.18 MBq/kg (0.14 mCi/kg). The blood glucose level
was checked and kept below 8.33 mmol/L (150 mg/dL). After $^{18}$F-FDG injection, standard sPET/CT images were acquired within 50–70 min using a Gemini TF 16 PET/CT scanner (Philips Healthcare). Initial low-dose CT (120 kVp, 50 mAs, 4 mm slice thickness) was performed first, and then PET images were obtained. PET images were reconstructed using the 3D RALMA iterative OSEM algorithm (3 iterations, 33 subsets, no filtering) and CT-based attenuation correction was performed. Immediately after the routine torso sPET/CT, the patient changed to a prone position, and additional regional pPET/CT was performed. Image acquisition settings and reconstruction algorithms of both sPET/CT and pPET/CT were the same as above.

**PET/CT image analysis**

For the semi-quantitative analysis, a nuclear medicine board-certified physician (10 years of experience in PET reading and analysis) measured the SUV$_{\text{mean}}$ through the workstation (Advantage Workstation 4.7, GE Healthcare) by placing the ROI of the lung 2 cm above the diaphragm [11]. ROI of the right lung was divided into the anterior, mid, and posterior parts (Fig. 2) [12]. The dependent lung refers to the posterior lung ROI in sPET/CT and the anterior lung ROI in pPET/CT, and vice versa for the nondependent lung. The Hounsfield unit (HU) of each ROI was also measured. Additionally, visual grading of $^{18}$F-FDG uptake in the posterior lung, a gravity-dependent area in sPET/CT, was performed. For visual analysis, a four-point scale was used with the SUV window level set from 0 to 5; grade 0: no significant $^{18}$F-FDG uptake distinct from the background lung, grade 1: visually discernible $^{18}$F-FDG uptake which is higher than the background lung but lower than that of the liver $^{18}$F-FDG uptake, grade 2: similar $^{18}$F-FDG uptake to the liver, and grade 3: higher $^{18}$F-FDG uptake than that of the liver [13, 14]. We also measured the tissue fraction corrected SUV$_{\text{mean}}$ (SUV-TF$_{\text{mean}}$) via the previously described method suggested by Lambrou et al. to exclude the air fraction of the lung because $^{18}$F-FDG is not distributed in the air [7]. Using this method, the SUV-TF$_{\text{mean}}$ can be calculated by measuring the SUV$_{\text{mean}}$ and HU of the lung ROI [15].

The evaluation of underlying lung parenchymal disease was performed by a chest radiologist with 15 years of experience through chest CT via the helical technique (100–120 kVp, 100–300 mAs; reconstruction was performed using a bone algorithm; 2 mm slice thickness, gantry rotation time of 0.28 sec, pitch of 0.6, table speed of 23 mm per rotation, and beam width of 38.4 mm), taken on the closest date before $^{18}$F-FDG PET/CT examination. Dependent atelectasis in lung parenchyma of the ROI was evaluated via low-dose chest CT taken together with $^{18}$F-FDG PET/CT; however, the thin-section chest CT taken closest to $^{18}$F-FDG PET/CT was also referred. The presence of dependent atelectasis on CT images was defined as crescent-shaped ground-glass opacities representing increased vascularity or shrinkage of lung parenchymal volume, or curvilinear lung parenchymal opacities perpendicular to the dependent wall of the hemithorax.

**Statistical analysis**

Statistical analyses were performed using IBM SPSS Statistics for Windows (Version 27.; IBM Corp. Armonk, NY, USA), STATA version 17.0 (StataCorp, College Station, TX, USA), and MedCalc Statistical
The paired t-test was used to compare multiple parameters (\(\text{SUV}_{\text{mean}}\), HU, and \(\text{SUV-TF}_{\text{mean}}\)) of each ROI (anterior, mid, and posterior lungs) according to their positions. Parameters of the dependent and the nondependent lungs were also compared using the paired t-test. The linear regression analyses were used to evaluate the association between the HU and \(\text{SUV}_{\text{mean}}\) of each ROI. \([^{18}\text{F}]\text{FDG PET/CT visual positivity according to the position was compared using the Wilcoxon signed-rank test.}\)

**Results**

**Clinical characteristics of the patients**

Among 197 patients who underwent \([^{18}\text{F}]\text{FDG PET/CT both in supine and prone positions in our institution, 62 were excluded because they had lung lesions (mass or nodule; } n = 24\), pleural effusion (\( n = 15\)), consolidative lesions or airway disease resulting in mosaic lung parenchymal attenuation (\( n = 14\)), and interstitial lung disease (\( n = 9\)) in their ROIs. Finally, 135 patients were included in this study (Figure 1). Patient characteristics are summarised in Table 1. The median patient age was 66 years (IQR: 58–75 years); 80 (59.3%) were men and 55 (40.7%) were women. Among them, 104 (77.0%) had underlying malignancies, 28 (20.7%) had indeterminate lung nodules, 2 (1.5%) had lymphadenopathy, and 1 (0.7%) had an indeterminate uterine mass. Although 90 patients (66.7%) had lung cancer or indeterminate lung nodules, no patient had masses or nodules in their ROIs after exclusion.

**\(\text{SUV}_{\text{mean}}\) and HU of the anterior, mid, and posterior lungs according to position**

The parameter differences between sPET/CT and pPET/CT of each lung ROI are summarised in Table 2. All of the anterior, mid, and posterior lung ROIs showed significantly different \(\text{SUV}_{\text{mean}}\), HU, and \(\text{SUV-TF}_{\text{mean}}\) in sPET/CT and pPET/CT (all \( p < 0.001\)), except for the \(\text{SUV}_{\text{mean}}\) of the mid lung (\( p = 0.196\)). In the anterior lung ROI, the \(\text{SUV}_{\text{mean}}\) (0.36 ± 0.09 vs. 0.45 ± 0.12, \( p < 0.001\)) and HU (−802 ± 43 vs. −731 ± 67, \( p < 0.001\)) were significantly lower in sPET/CT than pPET/CT. Conversely, in the posterior lung ROI, the \(\text{SUV}_{\text{mean}}\) (0.59 ± 0.14 vs. 0.42 ± 0.08, \( p < 0.001\)) and HU (−671 ± 66 vs. −790 ± 40, \( p < 0.001\)) were significantly higher in sPET/CT than pPET/CT. The \(\text{SUV}_{\text{mean}}\) and HU were significantly higher in dependent lungs in both sPET/CT and pPET/CT; however, the \(\text{SUV-TF}_{\text{mean}}\) of the anterior lung ROI was significantly higher in sPET/CT than in pPET/CT (1.91 ± 0.33 vs. 1.79 ± 0.35, \( p < 0.001\)). On the other hand, the \(\text{SUV-TF}_{\text{mean}}\) of the posterior lung ROI was significantly higher in pPET/CT than in sPET/CT (2.11 ± 0.36 vs. 1.90 ± 0.30, \( p < 0.001\)).

The parameter differences between the dependent and nondependent lungs on sPET/CT and pPET/CT are summarised in Table 2. On both sPET/CT and pPET/CT, the dependent lung showed a significantly higher \(\text{SUV}_{\text{mean}}\) (0.59 ± 0.14 vs. 0.36 ± 0.09, \( p < 0.001\); 0.45 ± 0.12 vs. 0.42 ± 0.08, \( p < 0.001\),
respectively) and HU (−671 ± 66 vs. −802 ± 43, *p* < 0.001; −731 ± 67 vs. −790 ± 40, *p* < 0.001, respectively) than the nondependent lung. The SUV\textsubscript{mean} of the dependent lung was 63.8% higher than that of the nondependent lung on sPET/CT (0.59 ± 0.14 vs. 0.36 ± 0.09, *p* < 0.001) but it was only 7.1% higher on pPET/CT (0.45 ± 0.12 vs. 0.42 ± 0.08, *p* < 0.001). When tissue fraction correction was performed, the SUV-TF\textsubscript{mean} of the dependent and nondependent lungs did not differ significantly in sPET/CT (1.91 ± 0.33 vs. 1.90 ± 0.30, *p* = 0.852) while in pPET/CT, the SUV-TF\textsubscript{mean} of the dependent lung was significantly lower than that of the nondependent lung (1.79 ± 0.35 vs. 2.11 ± 0.36, *p* < 0.001).

**Association between SUV\textsubscript{mean} and HU in supine and prone position PET/CT**

The results of the linear regression analysis of the SUV\textsubscript{mean} according to HU on both sPET/CT and pPET/CT are shown in Figure 3. The linear regression analysis revealed a strong association in sPET/CT between the SUV\textsubscript{mean} and HU (R = 0.86, *p* < 0.001). In pPET/CT, there was a moderate association between the SUV\textsubscript{mean} and HU (R = 0.65, *p* < 0.001) (Figure 3). This difference in the degree of association is in line with that in Table 2. The SUV-TF\textsubscript{mean} of anterior and posterior lung ROIs did not differ significantly in sPET/CT but differed significantly in pPET/CT.

**Visual \(^{18}\text{F}\)FDG uptake in the posterior lung according to position**

Visual \(^{18}\text{F}\)FDG uptake in the posterior lung according to the supine and prone position is summarised in Table 3. Out of 135 patients, 115 (85.2%) had visually discernible \(^{18}\text{F}\)FDG uptake (grades 1 or 2) on sPET/CT. However, no patient had visually discernible \(^{18}\text{F}\)FDG uptake on pPET/CT except for one patient (0.7%) with a persistent subpleural line. No patients showed \(^{18}\text{F}\)FDG uptake higher than that of the liver (grade 3) on both sPET/CT and pPET/CT.

We performed subgroup analyses according to the CT findings. Of the 135 patients, 77 (57.0%) had dependent opacity or atelectasis on chest CT in the supine position. Among them, nine patients (11.7%) showed high \(^{18}\text{F}\)FDG uptake (grade 2, similar to the liver) on sPET/CT, which is high enough to interfere with the evaluation of small lung nodules (Figure 4). In eight of the nine patients, \(^{18}\text{F}\)FDG uptake disappeared on pPET/CT, and \(^{18}\text{F}\)FDG uptake decreased from grade 2 to 1 in one patient with a persistent subpleural line. The remaining 58 patients (43.0%) had no dependent opacity or atelectasis on chest CT and did not have high \(^{18}\text{F}\)FDG uptake (grade 2 or 3).

**Discussion**

In the atelectatic lung, the SUV\textsubscript{mean} may increase due to the dense alveolar structure of the collapsed lung [16]. Because the alveolar size of the posterior lung is smaller than that of the anterior lung in the supine
position [17], the attenuation of the dependent lung is higher than that of the nondependent lung [11]. As demonstrated by the linear regression analysis, \(^{18}\text{F}\)FDG uptake is proportional to HU and is higher in the dependent lung than in the nondependent lung. When the air fraction was removed, there was no significant difference in the SUV\(_{\text{mean}}\) (SUV-TF\(_{\text{mean}}\)) between the dependent and nondependent lungs in sPET/CT. Therefore, we think gravity-dependent opacity-related \(^{18}\text{F}\)FDG uptake is a secondary finding due to increased attenuation rather than other factors such as inflammation. \(^{18}\text{F}\)FDG uptake in any lung ROI was not higher than that of the liver, and the SUV-TF\(_{\text{mean}}\) was \(\sim 2.0\), which is similar to that of other solid organs, which supports our hypothesis.

Since \(^{18}\text{F}\)FDG uptake is proportional to HU, it is reasonable to think that gravity-dependent opacity-related \(^{18}\text{F}\)FDG uptake would decrease on pPET/CT. As we expected, \(^{18}\text{F}\)FDG uptake in the posterior lung was significantly decreased on pPET/CT in both semi-quantitative and visual analyses. In particular, all high \(^{18}\text{F}\)FDG uptake similar to that of the liver in nine patients on sPET/CT decreased to lower than that of the liver on pPET/CT.

Although SUV\(_{\text{mean}}\) and HU were higher in the dependent lung than in the nondependent lung on both sPET/CT and pPET/CT, the difference was lesser in pPET/CT (Table 2). Unlike the smaller alveolar size of the dependent lung in the supine position, the alveolar size becomes more uniform in the prone position [17]. Therefore, the SUV\(_{\text{mean}}\) and HU on pPET/CT also seem to be more uniform than they are on sPET/CT.

On pPET/CT, the association between SUV\(_{\text{mean}}\) and HU was weaker than that on sPET/CT, and the SUV-TF\(_{\text{mean}}\) of the dependent and nondependent lungs differed significantly. This could be due to different proportions of lung tissues and blood between the two positions. The density of the lung is determined by the relative proportions of air, blood, and lung tissues [18]. Among these, Lambrou's method used in this study removes only the air fraction [7]. Because the SUV\(_{\text{mean}}\) of blood and lung tissues may differ, the SUV-TF\(_{\text{mean}}\) may be affected by the proportion of blood flowing to lung tissues. In general, solid organs such as the liver, kidney, spleen, and pancreas have a higher SUV\(_{\text{mean}}\) than the mediastinal blood pool [13, 19]. Therefore, SUV-TF\(_{\text{mean}}\) might be high when the lung tissue proportion is high, and it might be low when the blood proportion is high. Even if the SUV-TF\(_{\text{mean}}\) of the dependent and nondependent lungs are similar on sPET/CT due to similar proportions of lung tissues and blood, the SUV-TF\(_{\text{mean}}\) of the dependent lungs of pPET/CT may be lowered because the gravity-induced increase in blood perfusion may increase the blood proportion. Further studies are needed to prove this hypothesis.

Our study has two important clinical implications. First, when evaluating nodules located in the posterior lung, \(^{18}\text{F}\)FDG uptake of nodules may be indistinguishable from \(^{18}\text{F}\)FDG uptake caused by dependent atelectasis. In our study, 11.7% of patients with gravity-dependent opacity shown on CT had \(^{18}\text{F}\)FDG uptake similar to that of the liver. Small nodules or nodules with low \(^{18}\text{F}\)FDG uptake, such as lepidic-dominant adenocarcinoma, neuroendocrine tumours [4, 5], metastatic nodules from hepatocellular
carcinoma, or renal cell carcinoma [20, 21], may not have [$^{18}$F]FDG uptake that is distinct from the background lung activity. When pPET/CT is performed, gravity-dependent [$^{18}$F]FDG uptake can be reduced, as well as respiratory motion artefacts of the posterior lung [10] so that the posterior lung nodule can be evaluated properly. Second, when measuring parameters regarding lung inflammation in [$^{18}$F]FDG PET/CT, pPET/CT may be more accurate. Several studies have reported that lung inflammation parameters measured in [$^{18}$F]FDG PET/CT of interstitial lung disease reflect the disease activity and prognosis [22–26]. However, it is well known that gravity-dependent opacity can mimic early ILD, and prone position chest CT is sometimes performed if necessary [27]. Therefore, when measuring lung inflammation parameters in sPET/CT, gravity-dependent [$^{18}$F]FDG uptake can be a confounding factor because there is an anteroposterior gradient in the lung. pPET/CT may be more appropriate because [$^{18}$F]FDG uptake is more uniform.

This study has several limitations. First, respiratory gating was not available in our institution. In PET/CT, respiratory misregistration of CT and PET may occur, especially in sPET/CT [10]; so, tissue fraction correction using SUV$_{mean}$ and HU may be inaccurate. Second, the lung ROIs of sPET/CT and pPET/CT may not exactly match each other because the shape of the lungs changes with the patient's position [28].

In conclusion, lung [$^{18}$F]FDG uptake and HU have a moderate-to-strong effect on PET/CT, and pPET/CT can effectively reduce gravity-dependent opacity-related [$^{18}$F]FDG uptake.

**Abbreviations**

CT  
computed tomography  
[$^{18}$F]FDG  
[$^{18}$F]fluorodeoxyglucose  
HU  
Hounsfield unit  
PET/CT  
positron emission tomography/computed tomography  
pPET/CT  
prone position PET/CT  
ROI  
region of interest  
sPET/CT  
supine position PET/CT  
SUV$_{mean}$  
mean standardised uptake value  
SUV-TF$_{mean}$
tissue fraction corrected $\text{SUV}_{\text{mean}}$

References


Declarations

Funding

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Competing Interests

The authors have no relevant financial or non-financial interests to disclose.

Author Contributions

The authors’ contributions are as follows: YH Song and JW Moon participated in the study design, drafting of the manuscript, and data acquisition and analysis; YN Kim, JY Woo, and HJ Son participated in data acquisition and data analysis; SH Lee participated in the study conception and design, data
analysis, manuscript revision, and approval of the final content of the manuscript. All authors have read and approved the final manuscript.

Data Availability

The datasets analysed during the current study are available from the corresponding author on reasonable request.

Ethics Approval

This study was performed in line with the principles of the Declaration of Helsinki. This study was approved by the Institutional Review Board of our institution (IRB no. 2022-02-017).

Consent to Participate and Publish

The institutional review board approved this study and waived informed consent for the retrospective study.

Tables

Table 1. Patients’ characteristics
Table 2. Characteristics of chest CT and [18F]FDG PET/CT findings

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Supine</th>
<th>Prone</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\text{SUV}_{\text{mean}}$ anterior, (mean ± SD)</td>
<td>0.36 ± 0.09</td>
<td>0.45 ± 0.12</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>$\text{SUV}_{\text{mean}}$ mid, (mean ± SD)</td>
<td>0.45 ± 0.10</td>
<td>0.45 ± 0.09</td>
<td>0.196</td>
</tr>
<tr>
<td>$\text{SUV}_{\text{mean}}$ posterior, (mean ± SD)</td>
<td>0.59 ± 0.14</td>
<td>0.42 ± 0.08</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>$p^1$</td>
<td>&lt;0.001*</td>
<td>&lt;0.001*</td>
<td></td>
</tr>
<tr>
<td>HU anterior, (mean ± SD)</td>
<td>−802 ± 43</td>
<td>−731 ± 67</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>HU mid, (mean ± SD)</td>
<td>−751 ± 42</td>
<td>−767 ± 44</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>HU posterior, (mean ± SD)</td>
<td>−671 ± 66</td>
<td>−790 ± 40</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>$p^2$</td>
<td>&lt;0.001*</td>
<td>&lt;0.001*</td>
<td></td>
</tr>
<tr>
<td>$\text{SUV-TF}_{\text{mean}}$ anterior, (mean ± SD)</td>
<td>1.91 ± 0.33</td>
<td>1.79 ± 0.35</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>$\text{SUV-TF}_{\text{mean}}$ mid, (mean ± SD)</td>
<td>1.92 ± 0.32</td>
<td>2.03 ± 0.33</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>$\text{SUV-TF}_{\text{mean}}$ posterior, (mean ± SD)</td>
<td>1.90 ± 0.30</td>
<td>2.11 ± 0.36</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>$p^3$</td>
<td>0.852</td>
<td>&lt;0.001*</td>
<td></td>
</tr>
</tbody>
</table>

SD, standard deviation; $\text{SUV}_{\text{mean}}$, mean standardised uptake value; $\text{SUV-TF}_{\text{mean}}$, tissue fraction corrected $\text{SUV}_{\text{mean}}$
\( p^1 \) compares \( \text{SUV}_{\text{mean}} \) anterior and \( \text{SUV}_{\text{mean}} \) posterior; \( p^2 \) compares HU anterior and HU posterior; \( p^3 \) compares \( \text{SUV-TF}_{\text{mean}} \) anterior and \( \text{SUV-TF}_{\text{mean}} \) posterior.

\* \( p < 0.05 \) was considered statistically significant.

**Table 3.** Comparison of the visual grade of \([^{18}\text{F}]\text{FDG PET/CT}\) in the posterior lung according to the supine and prone positions

<table>
<thead>
<tr>
<th>CT findings</th>
<th>Grade</th>
<th>Supine</th>
<th>Prone</th>
<th>( P )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent opacity or atelectasis (n = 77)</td>
<td>0</td>
<td>2 (2.6%)</td>
<td>76 (98.7%)</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>66 (85.7%)</td>
<td>1 (1.3%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>9 (11.7%)</td>
<td>0 (0.0%)</td>
<td></td>
</tr>
<tr>
<td>Unremarkable (n = 58)</td>
<td>0</td>
<td>18 (31.0%)</td>
<td>58 (100%)</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>40 (69.0%)</td>
<td>0 (0.0%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td></td>
</tr>
<tr>
<td>Total patients (n = 135)</td>
<td>0</td>
<td>20 (14.8%)</td>
<td>134 (99.3%)</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>106 (78.5%)</td>
<td>0 (0.0%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>9 (6.7%)</td>
<td>0 (0.0%)</td>
<td></td>
</tr>
</tbody>
</table>

\* \( p < 0.05 \) was considered statistically significant.

**Figures**
Figure 1

Flow diagram of patient enrollment

\[^{18}\text{F}]\text{FDG, }[^{18}\text{F}]\text{fluorodeoxyglucose; PET/CT, positron emission tomography/computed tomography}\]
Figure 2

Divisions of the lung on $[^{18}\text{F}]$FDG PET/CT

Each lung is divided into three sections—anterior (A), mid (M), and posterior (P)—along the anteroposterior axis.

$[^{18}\text{F}]$FDG, $[^{18}\text{F}]$fluorodeoxyglucose; PET/CT, positron emission tomography/computed tomography
Figure 3

**Linear regression analysis between HU and SUV\text{mean}**

A higher correlation between HU and SUV\text{mean} is observed on supine position PET/CT ($R = 0.86, p < 0.001$) than prone position PET/CT ($R = 0.65, p < 0.001$).

HU, Hounsfield unit; PET/CT, positron emission tomography/computed tomography; SUV\text{mean}, mean standardised uptake value

Figure 4
Gravity-dependent opacity-related $^{18}$F-FDG uptake surrounding a lung nodule

A 60-year-old man with a 14 mm pulmonary nodule in the right lower lobe undergoes a $^{18}$F-FDG PET/CT. The $^{18}$F-FDG uptake of the lung nodule cannot be clearly identified from background lung due to gravity-dependent opacity related $^{18}$F-FDG uptake similar to liver on supine position PET/CT (black arrowheads on A, B, and C). As the gravity-dependent opacity decreases on prone position PET/CT, the nodule shows a definitely positive $^{18}$F-FDG uptake (white arrowheads on D, E, and F). The nodule is diagnosed as small cell lung cancer by biopsy.

$^{18}$F-FDG, $^{18}$fluorodeoxyglucose; PET/CT, positron emission tomography/computed tomography