Relative Biodistribution and Tumor Uptake of $^{124}\text{I}$–NM404, a.k.a. CLR1404, in Humans with Non–Small Cell Lung Cancer

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INTRODUCTION

$^{124}\text{I}$, a.k.a., CLR1404, is a refined, second-generation diagnostic phosphor used as a follow-up to the predominantly tumor uptake and prolonged tumor retention in $^{185}\text{W}$-washed, spontaneous, and transgenic prostate tumor models. It is also a novel iodinated in vivo imaging agent (Figures 1, 3, 4). $^{124}\text{I}$ is a common nuclear medicine tracer, both as a radiopharmaceutical (124) and as a diagnostic and therapeutic (SPECT) agent for the detection and treatment of multiple solid cancers, including non-small-cell lung cancer (NSCLC).

The aim of this study is to demonstrate the relative biodistribution and tumor uptake of $^{124}\text{I}$–NM404 in humans with NSCLC evaluated with PET/CT.

METHODS

Three subjects with systemic NSCLC were injected with 385 MBq and one subject with 250 MBq of $^{124}\text{I}$–NM404. Whole-body PET scans were acquired at five different time points over six days after injection. The resulting images were compared with those of F–FDG. The blood pool and the major organs of interest were quantitatively measured and qualitatively analyzed.

RESULTS & ANALYSIS

In the first 24 hours, injected $^{124}\text{I}$–NM404 was highest in the blood pool compared to other organs, but blood pool activity decreased most rapidly during the first 24 hours. $^{124}\text{I}$–NM404 is known for high biliary binding to plasma and liver persistent. Blood pool activity would be associated with the (Graph 1).

Liver uptake in 1 out of 3 subjects demonstrated the highest initial uptake with little clearance in the first 24 hours. But by day 6, liver uptake shows relative stability. The whole time this shows demonstrated very similar 60%–70% in the liver as well as a similar pattern of radionuclide excretion (Figure 2).

One subject had the highest uptake in the liver that did not change significantly over 6 days (Figure 3). The logic for this is not known and still under study. There was normal biliary $^{124}\text{I}$–FDG uptake and no obvious abnormal retention on SC. Initially, this subject had a previous cholecystectomy, and thus may have an elevated uptake in the liver, not as apparent when compared to the major organs and blood pool. All 3 subjects were very consistent except for one subject with a slightly elevated uptake in 6 subjects, the content variable outcome through time was seen in the kidneys.

$^{124}\text{I}$–NM404 does not have significant uptake in normal brain tissue (such as the kidneys or brain). In all 4 subjects, the uptake was very consistent across the different organs decreases with increasing tumor to background uptake over time.

Two subjects demonstrated both F–FDG and $^{124}\text{I}$–NM404 avid malignant lung lesions. Of note, one subject had evidence of malignancy only on $^{124}\text{I}$–NM404. Multiple PET and long lesion studies were positive on $^{124}\text{I}$–NM404 PET and (Graph 1). A less than 1 cm FDG avid pulmonary lesion seen on a (Graph 2), a less than 1 mm diameter metastatic lesion in the liver seen on (Graph 3). The lesions were not clearly identified, even after retrospective evaluation of the $^{124}\text{I}$–NM404 PET/CT study. These lesions were clearly identified on the $^{124}\text{I}$–NM404 scan. A left subcentimeter lesion, which was identified on a (Graph 4).

CONCLUSIONS

The relative normal organ biodistribution of $^{124}\text{I}$–NM404 is reproducible and malignant tumor uptake has prolonged persistence with increasing tumor to background uptake over time.