Late PET/CT Findings of COVID-19 Pneumonia With 2 Different Radiopharmaceuticals in a Patient

PSMA Avidity Higher Than FDGs

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Abstract: We present the ^{68}Ga-PSMA and ^{18}F-FDG PET/CT findings comparatively of a 67-year-old prostate cancer and malignant melanoma patient who had COVID-19 pneumonia 3 months ago. In ^{68}Ga-PSMA PET/CT, ground-glass opacities showing markedly increased PSMA uptake were observed in the patient's lungs. It was learned that the patient had COVID-19 pneumonia 3 months ago and was treated in the intensive care unit for 13 days. In ^{18}F-FDG PET/CT, FDG uptake was minimal in the same areas. In the midterm period after COVID-19 pneumonia, lung PSMA uptake is more intense than FDG, which may help better understand the disease's healing phase.

Key Words: FDG, PSMA, PET/CT, COVID-19, ground-glass opacities

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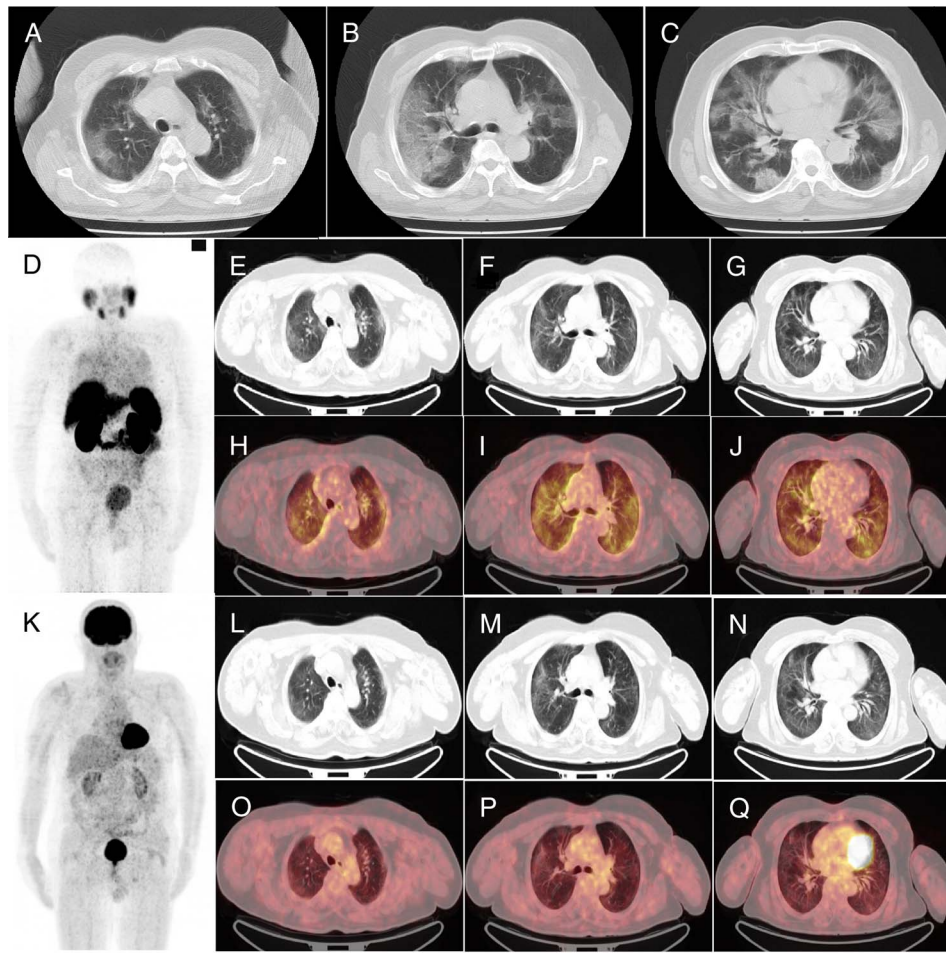

FIGURE 1. A 67-year-old man, diagnosed with nonmetastatic malignant melanoma 2 years ago and newly diagnosed with prostate carcinoma with a Gleason of 4 + 5, was admitted. In ^{68}Ga–prostate-specific membrane antigen (PSMA) PET/CT (**D**–**J**) performed for staging, faint ground-glass opacities (GGOs) suggesting COVID-19 pneumonia showing significant PSMA uptake in both lungs were observed (**D**, PET MIP; **E**–**G**, axial CT images; and **H**–**J**, axial PET/CT fusion images). There was no sign of prostate cancer residue or metastasis. It was learned that the patient was diagnosed with RT-PCR (+) COVID-19 three months ago and was hospitalized for 17 days, 13 days in the intensive care unit. Laboratory findings were as follows: C-reactive protein level, 142.68 mg/L; lymphocyte count, 0.2 $\times$ 10^3/μL (2%); sedimentation, 81 mg/h; fibrinogen, 534.0 mg/dL; and ferritin, 467 μg/L. There were multilobar peripheral GGOs in the thorax CT applied when he was COVID-19 positive (**A**–**C**, axial thorax CT images). The patient was treated with hydroxychloroquine, favipiravir, tocilizumab, enoxaparin sodium, dornase alfa, prone positioning, high-flow oxygen, and continuous positive airway pressure. The patient did not have any complaints after he was discharged. Five days after ^{68}Ga-PSMA PET/CT, ^{18}F-FDG PET/CT was applied for restaging malignant melanoma (**K**–**Q**). FDG uptake was minimal in ^{18}F-FDG PET/CT in faint GGO, where PSMA uptake was clearly observed (**L**–**N**, axial CT images; **O**–**Q**, axial PET/CT fusion images). After PET/CT scans, COVID-19 IgG was 117.5 S/CO. When the SUV_{max} of the GGO areas showing the most intense radiopharmaceutical uptake was compared with the SUV_{max}'s in the region where COVID-19 lesions were not observed (apex), the results were 3.9 (4.3/1.1) for PSMA and 2 (2/1) for FDG. Asymptomatic cases of COVID-19 pneumonia detected incidentally with various radiopharmaceuticals on PET/CT have been reported before.[1,2] The mid- or late-term CT findings of patients who survived COVID-19 pneumonia have been described in various studies.[3,4] Accordingly, residual findings are observed in 42% of the patients 3 months after the diagnosis, and the most common radiological finding is GGO (54%).[4] In patients recovering from COVID-19 pneumonia (RT-PCR twice negative), residual pulmonary lesions in FDG PET/CT have been shown to still have FDG uptake.[5,6] The authors evaluated these findings as continuing inflammation in the healing lung. FDG uptake decreases in the recovery phase compared with the active period.[7] In another case, FDG accumulation was reported in residual GGOs even 6 months after recovery.[8] Incidental COVID-19 pneumonia findings have been reported in very few cases in ^{68}Ga-PSMA PET/CT, and it can be said that the PSMA uptake is generally lower than FDG.[9–11] In the case we presented, we detected that PSMA uptake in residual lung lesions was more intense than FDG 3 months after recovery from COVID-19. Increased uptake of radiopharmaceuticals in the late period of COVID-19 can be explained by capillary penetration caused by local inflammation and relatively elevated activity in the interstitial space.[12] However, the higher PSMA uptake in the same patient than FDG suggests that the regenerative and reparative process that causes PSMA expression from neovascular system endothelial cells is more dominant than the inflammatory process.[13]