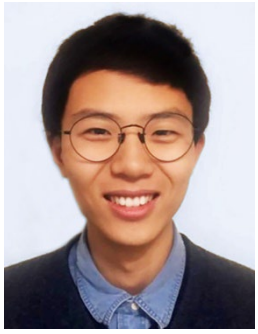

Multi-organ metabolic changes in COVID-19 recovery measured with total-body dynamic ^{18}F-FDG PET

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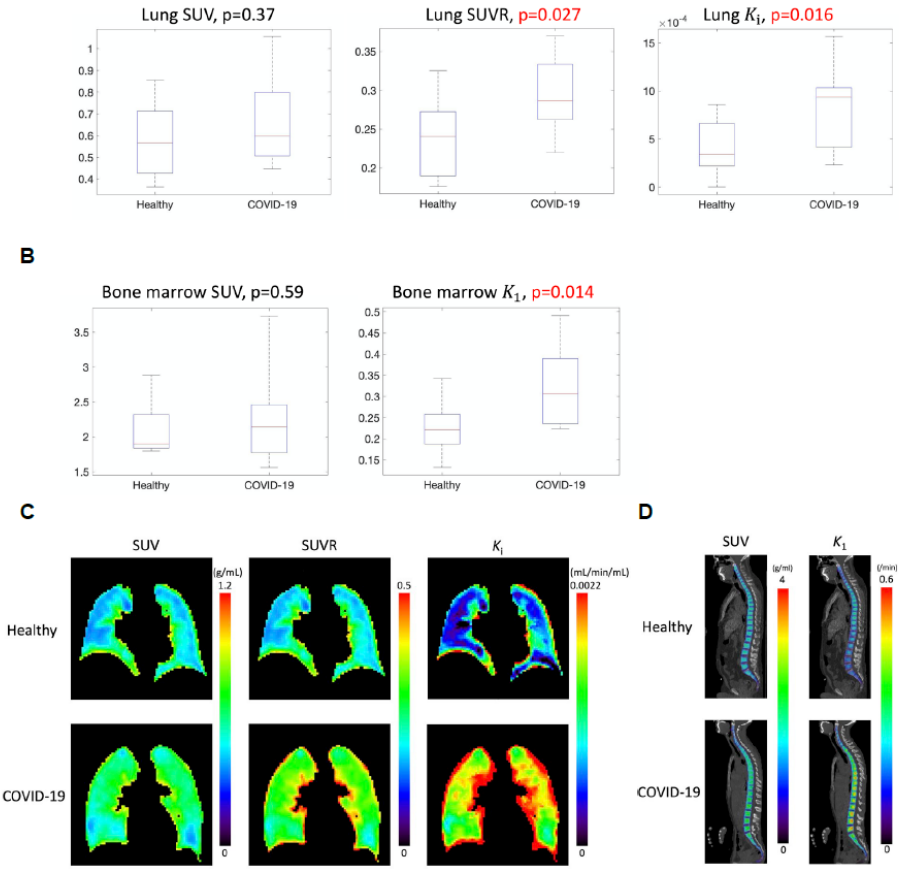
Introduction: COVID-19 can affect multiple organs and the prolonged impacts have not been thoroughly investigated. Total-body dynamic ^{18}F-FDG PET, e.g., on the 2-m long uEXPLORER system, combined with kinetic modeling permits a quantitative evaluation of metabolism in the entire body. In this paper, we investigate the metabolic changes in multiple organs of COVID-19 subjects in the early recovery period using total-body dynamic ^{18}F-FDG PET and kinetic modeling.

Methods: The study enrolled thirteen healthy subjects and eight recovering COVID-19 patients who were within two months of confirmed diagnosis. Each subject had an ^{18}F-FDG scan on the uEXPLORER system for one hour. Regions of interest (ROIs) were placed in multiple organs in the reconstructed total-body images to obtain parameters. The ROI-based parameters include the standardized uptake value (SUV), SUV ratio relative to blood (SUVR), ^{18}F-FDG rate constants K_1~k_4 by compartmental modeling, and net influx rate $K_i = K_1 k_3 / (k_2 + k_3)$. T-tests were performed to examine differences between the two groups over the parameters. We further generated parametric images to confirm the ROI-based analysis.



Discussion: The increases in ^{18}F-FDG lung metabolism (represented by SUVR and K_1) and bone marrow ^{18}F-FDG delivery may imply prolonged inflammation and immune response during the early recovery.

Conclusion: We detected increased lung glucose metabolism and bone marrow glucose delivery of recovering COVID-19 patients, which suggests continued impacts in early recovery. Kinetic quantification enabled by total-body dynamic ^{18}F-FDG PET provides a sensitive tool to monitor the metabolic changes in multiple organs.

Figure 1. A. Comparison of SUV, SUVR and ^{18}F-FDG net influx rate K_i between the healthy and the recovering COVID-19 groups. **B**. Comparison of SUV and ^{18}F-FDG delivery rate K_1 between the two groups. **C**. Lung SUV, SUVR and K_i parametric images of one example healthy subject and one example recovering COVID-19 subject. **D.** Bone marrow SUV and K_1 parametric images of the two subjects.