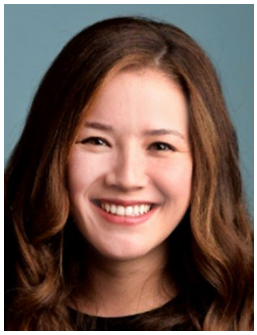

Total-body perfusion imaging using [^{11}C]-butanol

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Introduction: Tissue and organ perfusion is critically important in many pathologies. With total-body (TB-)PET we can quantitatively measure tissue and organ perfusion across the entire human body for the first time. Compared to commonly used perfusion tracers such as [^{15}O]-water and [13N]-ammonia, [^{11}C]-butanol has superior first pass extraction fraction across a very wide range of perfusion values. Here, we present the initial methods, dosimetry, and kinetic analysis of an ongoing study assessing the use of [^{11}C]-butanol for dynamic perfusion imaging across the entire body with TB-PET.

Methods: Seven subjects (6 healthy volunteers and 1 patient with peripheral arterial disease) were recruited into this IRB-approved study and gave written informed consent. At each visit, the subjects received an intravenous bolus injection of ~300 MBq of [^{11}C]-butanol and underwent a 30-minute dynamic acquisition at rest. Whole-organ regions of interest (ROIs) were delineated in tissues using PMOD. Dosimetry estimates were performed using OLINDA 2.0 and the MIRD method. In order to estimate regional perfusion (K_1, ml/min/ml), the first 4 minutes were used to perform 1-tissue compartment modeling using the descending aorta as the image-derived input function and joint estimation of bolus delay. Parametric images were generated using the same approach voxel-by-voxel but with the Akaike Information Criterion used to perform model selection.

Results: The average total effective dose was ~3.65 μSv/MBq. As shown by the K_1 maximum intensity projection images (MIPs) in Figure 1, repeat scans demonstrated similar flow estimates. In the patient with PAD, local changes in perfusion were observed using the contralateral limb as a control.

Conclusions: Quantitative dynamic total-body perfusion studies with [^{11}C]-butanol have been performed for the first time in humans. Further subject and patient recruitment will provide an estimate of the reliability and sensitivity of [^{11}C]-butanol parametric imaging using high-sensitivity high-spatial resolution total-body PET.

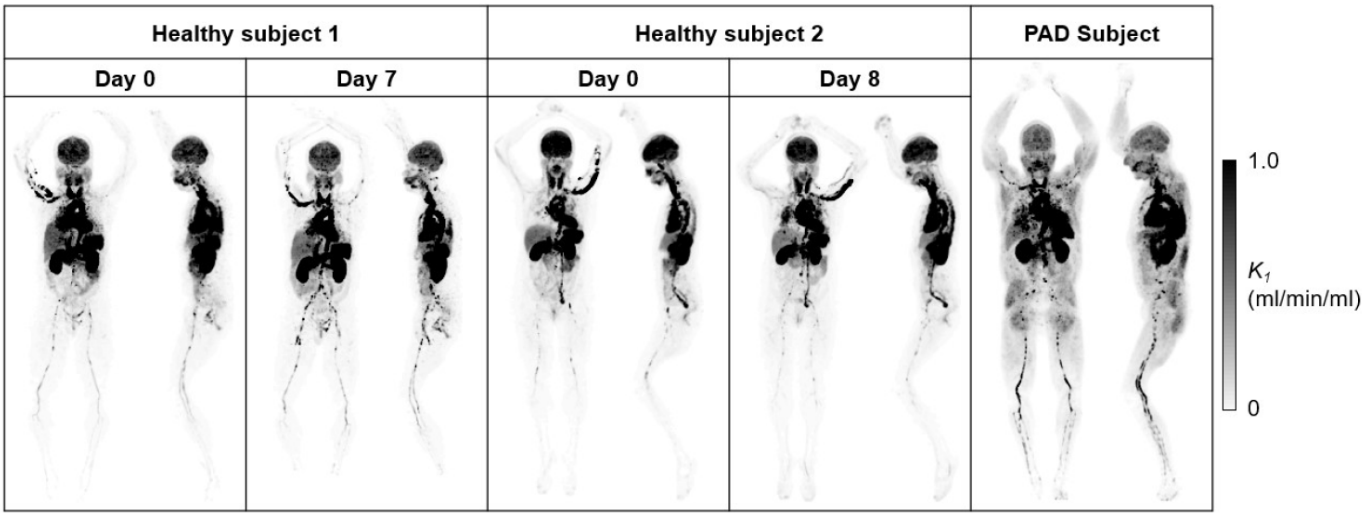

Figure 1. Maximum intensity projection (MIP) of K_1 (perfusion) for the first five acquisitions of the study.