# KINETIC MODELING AND PARAMETRIC IMAGING FOR HUMAN [$^{18}$F]DESMETHOXY-FALLYRIDE DYNAMIC PET STUDIES

Yun Zhou[1], Hans-Georg Buchholz[3], Gerhard Gründer[2], Thomas Siessmeier[3], Markus Piel[4], Ingo Vernaleken[2], Frank Rösch[4], Peter Bartenstein[3], Dean F. Wong[1]

*[1]Department of Radiology, Johns Hopkins Medical Institutions, Baltimore, MD, USA; [2]Department of Psychiatry and [3]Nuclear Medicine, [4]Institute of Nuclear Chemistry; University of Mainz, Mainz, Germany*

**Introduction**: [$^{18}$F]desmethoxyfallypride ([$^{18}$F]DMFP) is a new reliable PET tracer for imaging D2-like dopamine (DA) receptors in human with an advantage of longer physical half-life which may be useful for pharmacological challenging and activation studies (1)**.** The objective of this study is to evaluate the kinetic behaviour of [$^{18}$F]DMFP in human brain tissues by region of interested (ROI) kinetic modeling method and parametric imaging approaches.

**Methods**: PET studies on 16 health volunteers, ages 34 ± 10, were performed on an ECAT EXACT scanner (CTI/Siemens, Knoxville, TN) after the intravenous bolus injection of 206 ± 41 MBq (mean ± SD) [$^{18}$F]DMFP of high specific activity. Each dynamic image set consisting of 28 frames over 124 min and 47 planes were reconstructed using filtered back projection with Ramp filter resulting in a spatial resolution of about 6 mm FWHM (matrix size 128x128, pixel size 2.06 mm, slice thickness 3.38 mm). A metabolite-corrected plasma time radioactivity was obtained in each study. A: 3-compartmental 5-parameter model ($K_1$, $k_2$, $k_3$, $k_4$, and $V_p$), B: same configuration as in A, but cerebellum was used as reference tissue (receptor free, $k_3$=$k_4$=0) and $K_1/k_2$ was assumed to be the same in cerebral tissues. C: 2-compartmental 3-parameter ($K_1$, $k_2$, Vp) (2CM), and D: a simplified reference tissue model to estimate $R_1$(=$K_1$(tissue)/$K_1$(cerebellum)) and BP. In methods C, Binding potential (BP) was estimated indirectly by DV(tissue)/DV(cerebellum)-1. Method C and D were also implemented by a linear regression with spatial constraint algorithms for parametric imaging (2, 3). Parameters estimated by above methods as a function of scanning time was investigated.

**Results**: $K_1$ and DV are robust to the quantification methods and studying time. BP estimated by all the above methods is tending to be stable for scanning time >60 min. Method C fitted the kinetics well and its estimates becoming stable as short as 45 min (Fig. 1). Method B and C give almost same BP estimates. Method A is not stable and has convergence problem with nonlinear regression, especially for scanning time < 90 min and tissues of lower density of DA receptors, such as thalamus. The BP is underestimated by simplified reference tissue model, but of highly linear correlation with those estimated by compartmental model with plasma input function.

**Conclusions**: The kinetic parameters can be reliably estimated by both ROI kinetic modeling and parametric imaging with cerebellum as reference constraint in the bolus dynamic [$^{18}$F]DMFP PET studies within 60 min.

**References**:

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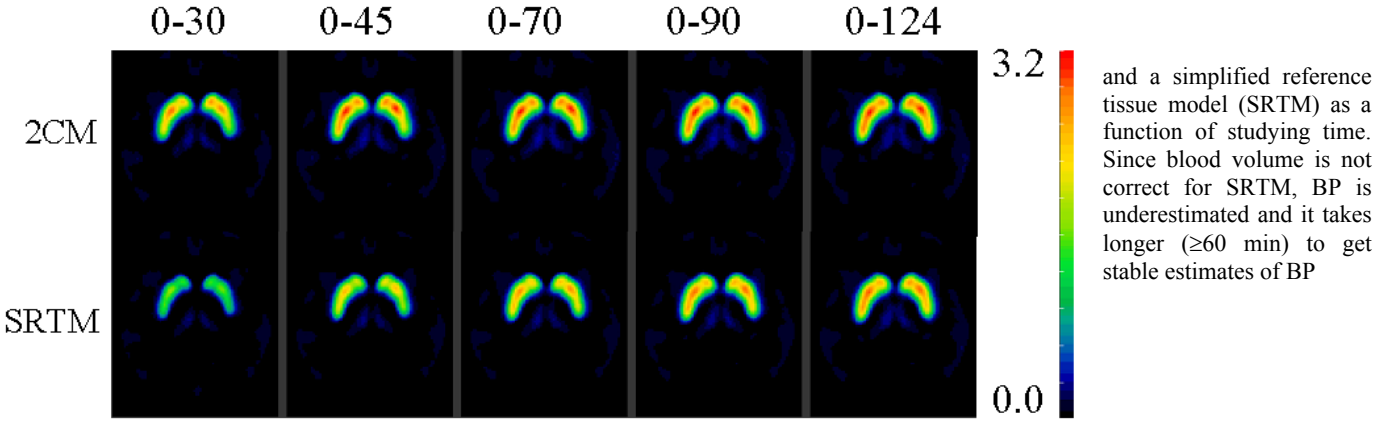


Fig. 1.Mean (n=16) of spatially normalized BP images in the standard space for a 2-compartmental 3-parameter model (2CM) and a simplified reference tissue model (SRTM) as a function of studying time. Since blood volume is not correct for SRTM, BP is underestimated and it takes longer (≥60 min) to get stable estimates of BP