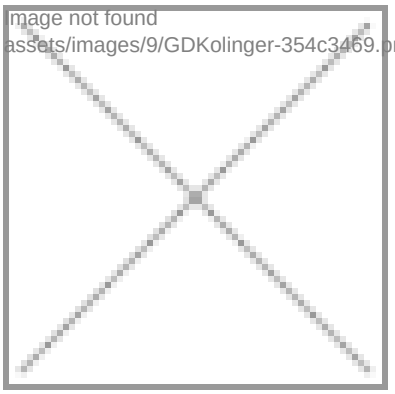
Multi-Parametric Pharmacokinetic Approaches for Improved brain PET quantification

HOST INSTITUTION: *University Medical Centre Groningen (UMCG)*

The University Medical Center Groningen (UMCG) is an academic hospital in the Netherlands. The UMCG is a public body and non-profit organisation, dedicated to health care with core activities focused on treatment, education and research. The Nuclear Medicine and Molecular Imaging (NMMI) department has an ongoing and strong research line regarding the use, implementation and validation of new quantitative imaging biomarkers in oncology and neurology for drug development, care and research. There is ample experience in participating in and setting up multi-centre studies, including efforts in harmonizing imaging procedures and imaging system (PET/CT and PET/MR) performances to assure exchange and pooling of quantitative imaging studies. Moreover, there is a strong interest in quantitative imaging and technical and biological validation of new multi-parametric imaging biomarkers.



DESCRIPTION OF THE PROJECT (ESR 5 - Guilherme Domingues Kolinger)

The ESR will develop and evaluate various new image analysis methodologies in order to improve quantitative brain PET studies. The following research topics are part of the project: (1) new multi-parametric strategies to improve the accuracy and precision of PET pharmacokinetic analysis; (2) development and evaluation of novel multi-parametric cluster analysis methods for robust and reproducible extraction of reference tissue TACs from dynamic PET/MRI studies; (3) delineation of blood pool structures for dynamic brain studies using MR data (either structural of functional) and/or use MR derived segmentation as prior to improve cluster analysis based input function extraction; (4) approaches for partial volume correction, either based on segmentations and/or using iterative deconvolution approaches with multi-parametric information to regularize noise. The project will include several short-term (

Publications

Kolinger GD, Vállez García D, Lohith TG, Hostetler ED, Sur C, Struyk A, Boellaard R, and Koole M (2021) A dual-time-window protocol to reduce acquisition time of dynamic tau PET imaging using [18F]MK-6240. *EJNMMI Res* **11,** 49. https://doi.org/10.1186/s13550-021-00790-x

Kolinger GD, Vállez García D, Willemsen ATM, Reesink FE, de Jong BM, Dierckx RAJO, De Deyn PP, and Boellaard R (2021) Amyloid burden quantification depends on PET and MR image

processing methodology. *PLoS ONE* 16(3): e0248122. https://doi.org/10.1371/journal.pone.0248122

Kolinger GD, Vállez García D, Kramer GM, Frings V, Smit EF, de Langen AJ, Dierckx RAJO, Hoekstra OS, and Boellaard R (2019) Repeatability of [^{18}F]FDG PET/CT total metabolic active tumour volume and total tumour burden in NSCLC patients. *EJNMMI Res* **9,** 14. https://doi.org/10.1186/s13550-019-0481-1

You can find a summary of this publication here.

Presentations

EANM20: 'Dual-time-window dynamic [18F]MK-6240 PET protocols for improved quantification in longitudinal studies and stroke patients'

EANM20: 'Impact of [18F]FDG uptake time on non-small cell lung cancer PET radiomics and their repeatability' (poster presentation)