Positron emission tomography in infections associated with immune dysfunction

A.O. Ankrah, MD, PhD
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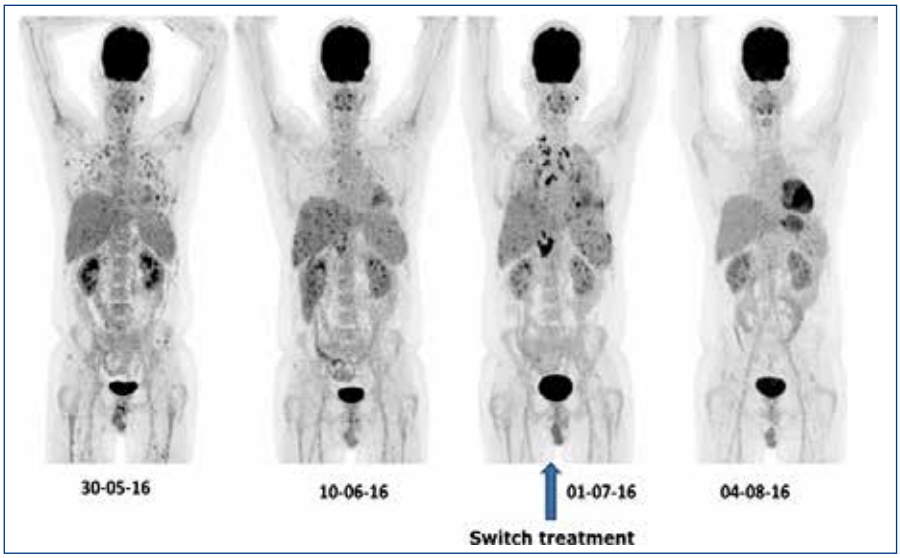
University of Groningen

Promotors:
Prof. A.W.J.M. Glaudemans, MD, PhD
Prof. M.M. Sathekge, MD, PhD
Prof. R.A.J.O Dierckx, MD, PhD

Co-promotor:
H.C. Klein, MD, PhD



[^{18}F]FDG-PET MIP images of a 38-year-old male with acute lymphoblastic leukemia. PET allowed follow-up of this case of probable IFI. Global TLG, which was in agreement with the visual analysis, showed an initial response (decreased from 401 at baseline to 30) by the second study. The patient developed unexplained fever and the third PET study showed new lesions (Global TLG 900), which directed clinicians to change antifungal therapy resulting in a complete metabolic response on the fourth study.

This thesis explores the role of positron emission tomography (PET) in infections associated with immune dysfunction. It focuses on three of these infections, which usually require either long term or even life-long treatment. The infections are Human Immunodeficiency Virus (HIV) infection, invasive fungal infections (IFIs) and tuberculosis (TB).
For HIV, the PET scan makes it possible to diagnose infections and malignancies resulting from HIV infection and to evaluate therapy. The metabolic uptake in the lymph nodes reflects viral replication and allows HIV staging. With TB and IFIs, PET allows for early detection of sites of infection in the body, all disease sites in the body can be detected in a single examination, and PET can monitor the treatment of these infections. Infection monitoring is useful in complex IFIs and TB, where traditional monitoring methods are often less than optimal. Visual analysis and the interpretation of PET images allowed the follow-up of individual lesions and the overall disease burden in IFIs. The metabolic parameters, total lesion glycolysis (TLG) and metabolic volume of [^{18}F] Fluorodeoxyglucose ([^{18}F]FDG) PET were found to have a predictive in the management of IFIs.
PET imaging can be done with different tracers, allowing for the evaluation of different biochemical processes in the body. The thesis investigated the benefits of imaging in TB with different tracers. The tracer uptake of ^{68}Gallium ([^{68}Ga]) citrate showed a significant correlation with the uptake of [^{18}F]FDG on PET imaging in TB. [^{68}Ga]citrate was shown to have superior lesion definition for intracerebral lesions compared to [^{18}F] FDG. Furthermore, preliminary studies suggest that [^{68}Ga]citrate may be useful in distinguishing post-infective inflammation from active infection. Overall, [^{18}F]FDG detected more lesions compared to [^{68}Ga]citrate.
The role of PET as a biomarker for infections undergoing infections associated immune dysfunction has the potential to greatly impact clinical practice. However, more research is needed to discover the ideal PET tracer and to standardise the interpretation and use of PET in this specific patient population.

ankrah.alfred@gmail.com ♦