[^{18}F]UCB-H BINDING QUANTIFICATION IN RAT BRAIN: FROM MODELLING TO SUV (#377)

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Introduction

Image quantification in Positron Emission Tomography (PET) is usually achieved through the invasive and sometimes infeasible arterial blood sampling [1, 2]. Alternative methods have been proposed, but a validation of their results is necessary [3, 4].

In the scope of improving the use of [^{18}F]UCB-H, a specific biomarker for the Synaptic Vesicle protein 2A (SV2A) [5, 6, 7, 8], we have compared the distribution volume (VT) obtained through full kinetic modelling using a Population Based Input Function (PBIF) [9], and the Standardized Uptake Value (SUV).

Methods

Twelve Sprague Dawley male rats were pre-treated with vehicle (saline), 1 or 10 mg/kg of SV2A ligand (Keppra®, IP). Thirty minutes later, [^{18}F]UCB-H was injected (IV) and a 90 min microPET dynamic acquisition was started followed by a T_2 structural MRI. Primary image analysis was focused in examining tracer measurement stability through 10 min time windows. Subsequently, we calculated the correlation between VT (90 minutes) and SUV values over consecutive 20-minute time frames searching for the optimal frame to perform a static acquisition [10]. Finally, we did a supplementary test-retest static acquisition, from 60 to 80 minutes, in order to test group differences in SUV.

Results/Discussion

Evaluation of ten minutes time windows showed more stability in VT than in SUV measures, for all the groups. This change in signal seems to decrease in late time frames. We found also a strong correlation (R^2>0.6) between dynamic VT and twenty minutes frame SUV, especially between 20 min and 60 min. From this, we can infer that an optimal frame to perform a static acquisition with [^{18}F]UCB-H would be between 50 and 80 minutes. Using a static acquisition from 60 to 80 minutes, the SUV highlighted statistically significant differences between the group injected with vehicle and the other groups ($p<0.01$), but not between groups pre-treated with 1mg/kg and 10mg/kg of Keppra®.

Conclusions

Our work shows that a strong correlation between the SUV and the VT parameter based on a PBIF does exist. This opens the way to a possible simplification for SV2A in vivo imaging with [^{18}F]UCB-H. Despite the fact that SUV is affected by many factors [11] and that it can overestimate results relative to VT [10], it is able to detect important differences in SV2A expression. Based on these results, SUV could become an interesting and easy to obtain parameter to study group differences in the context of several diseases.

References

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