IMAGING DYNAMICS OF ORGANS AND DRUGS AT SUB-HALF-MM AND SUB-MINUTE RESOLUTION USING FOCUSING PINHOLE SPECT

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ABSTRACT

We demonstrate new technologies for SPECT imaging with unsurpassed resolution in mice and rats. Results of the imaging of living animals will be shown. In addition development of detectors for next generation systems with an even higher resolution will be shown.

Index Terms— small animals, U-SPECT, U-CT

1. INTRODUCTION

Pivotal questions in pharmacology and biology concern how function of localized cells relates to disease. For example in experimental neuroscience we have dreamt about a magnifying glass that would allow us to see neurotransmitters in action, or in cardiovascular research about a system that would provide us simultaneously with myocardial anatomy, mechanical function, perfusion and cell function in small animals serving as models for human disease. Such studies have been limited by the availability of methods to study such molecular dynamics.

2. METHODS AND RESULTS

A Single Photon Emission Computed Tomography system called U-SPECT-II can quantify tracer dynamics in <0.35mm structures in total body mice and < 0.8mm in total body rat. Higher resolutions are possible with dedicated collimators presently under development. With a dedicated interface using three optical cameras the 75 pinholes of U-SPECT-II are focused to the area of interest to maximize sensitivity. Presented examples will include imaging the density and occupancy of dopamine transporters in sub-compartments of the mouse and rat brain, myocardial perfusion imaging in tiny parts (down to papillary muscles) of the beating mouse and rat heart or imaging of tumor markers in micro-metastasis, all during a range of points in time. Applied to different models of disease this will aid our understanding of dynamic processes that underlie tissue functions and human pathology. Several sub-half-mm resolution U-SPECT-II images and movies with sub-minute resolution will be shown as well as combined U-SPECT-II/CT images.

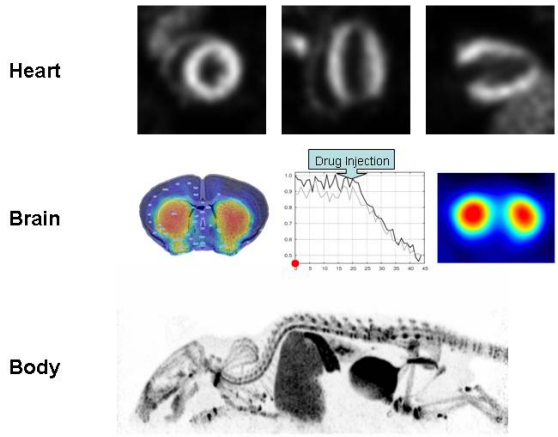

Fig 1. Mouse images showing cardiac perfusion (top), static and dynamic dopamine transporter occupancy in the striatum (center) and total body bone turnover.

3. CONCLUSIONS

Fast dynamic SPECT with sub-half-mm resolution in rodents is now available.

4. REFERENCES

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