MEDICAL UNIVERSITY INNSBRUCK

Open PhD Position

One 4 year PhD Student position (full-time) for the research project

„Multinuclear 23Na and 1H quantitative MRI in brain tumors and metastases“

in the new Doctoral School Image Guided Diagnostics and Therapy- Academic Research Triangle (IGDT-ART). Expected start at February 1st 2022 at the Department of Neuroradiology, Medical University of Innsbruck in Austria.

Envisioned qualification of the candidates:
Master or diploma degree in Biomedical Engineering, Physics or related fields with an experience in medical image analysis and MRI, advanced programming skills and an interest in basic medicine/neuroscience.

Aim of the project: Sodium (23Na) is the second most abundant MRI active nucleus and plays an important role in the human brain's metabolism. In several pathologies, such as cancer, a disturbed balance of the intra- and extracellular sodium concentration is present. In brain tumors, an increase was observed in total sodium concentration attributed to a disturbed cellular energy metabolism. Therefore, 23Na-MRI could provide valuable information in addition to 1H-MRI aiming for a more precise characterization of pathological changes in brain tumors and metastases prior and upon treatment. The aim of this project is to develop a hybrid imaging approach by combining 23Na and 1H quantitative MRI in a clinical setting with patients with brain tumors or brain metastases. One major focus will be the quantification of the multi-exponential 23Na and 1H effective transversal relaxation rate R2. This should be achieved by adapting existing MRI sequences to assess multi-echo 23Na and 1H images and by developing an image analysis method to separate slow and fast components of the total R2 signal decay for both 23Na and 1H. The different R2* components can than further be assigned to different microstructural tissue compartments, such as the intra- and extracellular sodium and water components. By applying the developed approach to the patients will allow to assess pathological differences in multi-compartmental 23Na and 1H relaxation in different brain tumors. For patients with metastases, this approach will allow the monitoring of treatment-induced microstructural changes. As 23Na and 1H imaging relies on different MR coils and MR sequences, image registration will be an important aspect. Therefore, this PhD project covers tasks from adapting and testing MR sequences, quantification of MR parameters, classical (non-AI) image analysis and the work in an interdisciplinary patient study.

Application deadline: December 15th, 2021 (will be extended)

For further information and the application guidelines see our website

https://phd-IGDT-ART.i-med.ac.at

or contact DI Dr. Christoph Birkl (christoph.birkl@i-med.ac.at).