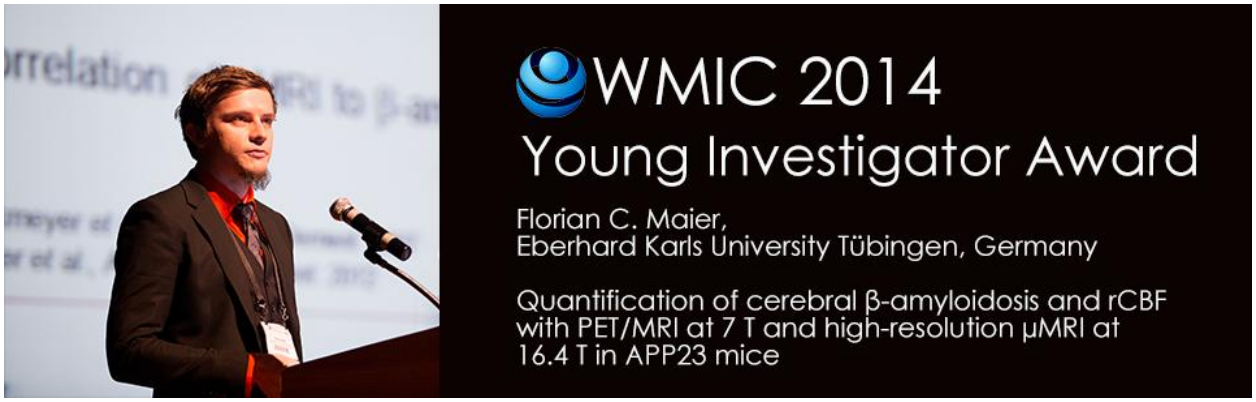

Talking with WMIC 2014 Young Investigator Award Winner, Florian C. Maier

- ***WMIS:*** *What do you think the impact of your work will be?*

Florian Maier: I hope that I could show that cooperations, also on an intercontinental scale, are important and fruitful, especially since one institute can never cover all scientific imaging fields at an expert level, so in my opinion, this type of collaborative work should be fostered in the future. In my opinion, I think that my work demonstrates that the future of non-invasive imaging is situated in utilizing multimodal and multifunctional imaging – and also in making use of new, advanced data analysis techniques, while the cross-correlation of the *in-vivo* data to gold-standard *ex-vivo* methods like immunohistochemistry remains crucial.

- ***WMIS:*** *Do you plan to extend the study?*

FM: We would like to transfer our µMRI imaging protocols to the *in-vivo* application in mice, and possibly also to the clinical field, although this will be very difficult. However, the advent of high-field clinical MRI scanners with flux-densities of 7 T (or even higher) could render the application of µMRI in AD patients feasible. In the future, it might be possible to detect amyloid plaque clusters and to match this information to amyloid-PET scans in the same patients.

- ***WMIS:*** *And, what does it mean to you to have received the Young Investigator Award?*

FM: For me personally, receiving the Young Investigator Award was a big honor. Especially in regards of the excellence of other submitted abstracts, I did not expect to receive this award. In my opinion, this is a prestigious, important and well-respected award in the community of molecular imaging. Here, I would like to emphasize, that this great achievement would have never been possible without the expert-work of my collaboration partners from the Centre for Advanced Imaging in Australia and of my dear colleagues from my home-laboratory, the Werner Siemens Imaging Center, and last but not least, the constant support and believe in my work of my PhD supervisor, Bernd Pichler. I would like to thank everyone who contributed to this study, and I also would like to thank the WMIC award committee for selecting me as the 2014 Young Investigator Awardee, thank you so much!

TITLE: Quantification of cerebral β-amyloidosis and rCBF with PET/MRI at 7 T and high-resolution µMRI at 16.4 T in APP23 mice

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EMPHASIS AND CATEGORY: Preclinical in vivo Studies/ Neurology

Paper summary

Quantifying the amyloid burden in fundamental research and in the clinical field of Alzheimer´s Disease is of paramount interest, especially in light of the amyloid cascade hypothesis [1]. Here, we present for the first time a combination of two distinctly different approaches towards the quantification of cerebral amyloidosis, [^{11}C]PIB-PET and high-resolution µMRI, and show the correlation of both imaging protocols to amyloid-immunohistochemistry. While [^{11}C]PIB-PET aims at quantifying the amyloid burden at low spatial resolution, but with high sensitivity, µMRI is a technique that is designated for visualizing amyloid deposits at the spatial resolution of single amyloid plaques, however, with reduced sensitivity. Thus, it appears logical to combine these two imaging approaches to benefit from both, high sensitivity and high spatial resolution. While [^{11}C]PIB-PET allowed a clear identification of brain regions, that are affected by amyloid deposition, µMRI even revealed substructures within single amyloid plaques correlating with the density of the amyloid deposition within these single plaques, as shown by amyloid immunohistochemistry.

As declining metabolic activity besides the prominent cerebral deposition of amyloid represents a second hallmark of Alzheimer´s Disease, and as the metabolic activity is tightly coupled to the regional cerebral blood flow (rCBF) [2], we also studied the rCBF by arterial spin labeling (ASL)- MRI in the same mice. Our study demonstrates an inverse correlation between [^{11}C]PIB-PET and rCBF on a voxel-based level and, thus, yields a second criterion for the identification of amyloid affected brains.

Taken together, [^{11}C]PIB-PET and high-resolution µMRI are a promising combination for the non-invasive quantification of the amyloid burden with yet unmatched sensitivity and specificity. Linking amyloid-targeting imaging with examinations of the accompanying brain physiology in the AD brain potentially aids disease staging and the evaluation of new treatment strategies, enabling both a morphological and functional classification of the underlying mechanism-of-action.

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