BMBS COST Action BM1103 Arterial spin labelling Initiative in Dementia (AID)

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Summary

The measurement of perfusion yields important diagnostic information about the health and functionality of an organ. Arterial spin labeling (ASL) is a contrast-agent free technique to measure perfusion and it can, in addition to perfusion, offer dynamic information such as arterial transit time (ATT). This dynamic information greatly complements diagnostics, especially in cases where perfusion is altered e.g. in Alzheimer Dementia.

Since the ASL perfusion signal is only about 2-5%, SNR is one of the key factors in ASL perfusion imaging. Over the years some variants of ASL were developed. Of these, pseudo-continuous ASL (pCASL) is the most favorable when it comes to SNR. Nevertheless, dynamic information such as the ATT is not yet included in standard pCASL.

Recently, a new time-encoded ASL approach was introduced that combines the high SNR of pCASL with dynamic information like ATT.

In this COST action between the Fraunhofer MEVIS, Bremen, Germany and the C.J.Gorter Center for High-field MRI, Leids Universitair Medisch Centrum, Leiden, the Netherlands, different implementations of the method for the clinical setup were investigated. In a clinical scan scenario patients are often agitated and motion has to be taken into account. Thus, the focus was on understanding the influence of motion and on improving the robustness of the method.

Within this STSM, the time-encoded ASL sequence was extended to include synthesized motion. This made it possible not only to simulate these clinical conditions in volunteer experiments but to apply the typical motion patterns with high reproducibility.

Furthermore, different time-encoding approaches were implemented. This allowed investigating the sensitivity of the different approaches to motion.

Finally, a measurement protocol was established and several datasets were recorded. These are analyzed in an ongoing collaboration between the C.J.Gorter Center for High-field MRI and Fraunhofer MEVIS, with the goal to optimize the robustness of the method for the use in the clinical routine.