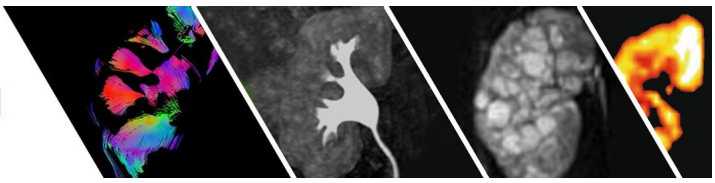


Comparison between PASL and pCASL for renal ASL

STSM start date 2019/01/21
STSM end date 2019/02/03
Grantee name

PURPOSE OF THE STSM

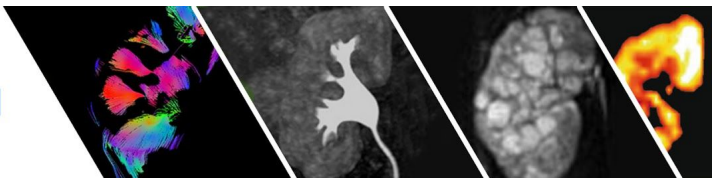
The main objective of this Short Term Scientific Mission (STSM) was to facilitate the comparison between the two labeling strategies most commonly used in renal ASL: Flow-sensitive Alternating Inversion Recovery (FAIR), a variant of Pulsed Arterial Spin Labeling (PASL) and Pseudo Continuous Arterial Spin Labeling (PCASL), for its use in renal ASL.
One of the main goals of the COST action CA16103 is to improve the standardisation and reproducibility of MRI biomarkers, including ASL. To that end, a panel of ASL experts is working to define a set of recommendations for the implementation of renal ASL. These recommendations should be based on available scientific data. However these two labeling techniques have never been previously compared in the kidney.
Therefore, results from the proposed study will help the ASL expert panel to identify the optimum acquisition approach.

DESCRIPTION OF WORK CARRIED OUT DURING THE STSM

The main focus of this mission was to define a renal ASL protocol to acquire images with a labeling configuration - for both strategies (FAIR and pCASL) - and a readout as close as possible for the two groups. The resulting images will help in the decision of which strategy provides better results among labeling schemes and which configuration is the most suitable to each vendor (Siemens, Philips, General Electric).
In order to achieve this goal, the following tasks have been carried out:

I. Implementation of pCASL and FAIR with SE-EPI readout

The first task was the configuration of the ASL schemes in the Philips MR scanner. The two groups agreed in using an SE-EPI readout module. Once the PCASL and FAIR labeling strategies were implemented and configured in the scanner, the image parameters were matched in order to have identical readout configuration.
The sequences were tested in healthy volunteers.



II. Experimentation with labeling timings

We experimented with different labeling timings in both sequences -PLD (Post labeling delay) for pCASL and TI (Inversion time) for FAIR. We acquired images in three volunteers with five different timings in order to compare the PLDs and TIs and the amount of signal.

III. Experimentation with Background suppression (BGS) pulses

Previous publications have shown that BGS pulses increase the perfusion signal temporal SNR due to the saturation of the static tissue signal and thus, all the signal in the substraction image (control-label) comes from perfusion.

We did some explorations with different BGS pulses for the pCASL, allocated in different temporal positions to evaluate the effect they produce on the final perfusion signal.

IV. Protocol Definition

PCASL implementation parameters were agreed between centers, with a preference of unbalanced scheme.

Three BGS pulses are going to be used. PLDs will be varied between 750ms and 2000ms.

FAIR Implementation with QUIPSSII, will use different TIs between 1200ms and 2000ms.

The two groups agreed in using a SE-EPI readout module, acquiring 5 slices to cover a wide section of the kidney with the minimum temporal spacing. The minimum number of control-label pairs were set to 20. In order to reduce the motion of the kidneys due to the respiration, respiratory triggering will be used.

V. Data acquisition of the STSM applicant

The STSM applicant was scanned in the host institution in which there is a Phillips scanner, in order to compare the data with the home institution acquisition (Siemens scanner).

VI. Data Processing

All the data was processed using MATLAB. Perfusion Weighted Images (PWI) were acquired as the substraction of each control-label pair using our scripts.

DESCRIPTION OF THE MAIN RESULTS OBTAINED

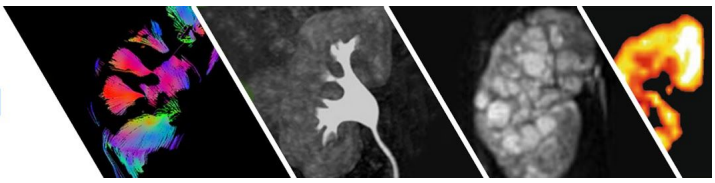
The main result of the STSM was the agreement forthe definition of the protocol, which will be implemented with similar configurations in the two centers with different vendors (Siemens, Philips).

The data acquired during the STSM in the volunteers was useful to ensure that the sequences were working properly and to choose the parameters to use in the protocol. The study will continue in each of the involved centers.

FUTURE COLLABORATIONS

Both groups are going to acquire data in several volunteers to test both sequences and to have more data to compare both labeling strategies.

Results will be discussed in the Aarhus meeting.



Acknowledgement
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