

Scientific report on COST Action BM1103

Workshop "Arterial Spin Labelling Initiative in Dementia"

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The first workshop on "Arterial Spin Labeling in Dementia" took place in Amsterdam, October 15th 2012. Essentially, it consisted of 3 sessions, one for each of the active working groups. In each session the respective WG presented the results of the previous work as well as the plans for future work. Active discussion took place in all sessions. The workshop showed that the COST action is well on track and in line with the proposed work programme.

Working group 1: MRI acquisition schemes for ASL

WG1 concentrated during the Amsterdam-meeting on three separate topics: the white paper on ASL, multi vendor-single sequence study, and the search for a high resolution ASL protocol.

White paper on ASL: The discussions as held previously at the COST-AID meeting in Bruxelles and during the ISMRM-workshop in Amsterdam, were summarized by Prof. Xavier Golay and additional input was obtained during this meeting. The white paper will contain recommendations on the labeling strategy, readout-modules, quantification models and interpretation of ASL-images and will be a co-production by the AID-action and the ISMRM perfusion study group. It will be published both in an MRI journal (i.e. JMRI) as well as a clinical journal (like AJNR). Both this discussion and previous discussions did not only lead to a widespread agreement about how to implement ASL in the clinical practice, but also served as an important educational tool by outlining the exact argumentation why to perform ASL-experiments in a certain manner. This has certainly benefitted the interaction between workgroup 1 and the other working groups.

Multi-vendor, single-sequence study: With the MRI community split into three major market shares (Philips, Siemens, and GE), an important question is whether similar ASL-experiments on the systems of the three vendors would yield similar results, when the sequence is equal over all scanner types. This is especially an important research question, when keeping the need for multi-center trials in mind as also envisioned in this action. To answer this question a small, joint research study is performed at a site that has systems of all three vendors (Oslo). In collaboration with three experts of WG1 a similar sequence will be implemented on systems of all vendors, which will subsequently be tested in a small group of volunteers on all three scanner types. During the meeting, the project was presented and data will be acquired, hopefully before the next meeting.

High resolution ASL protocol: One of the goals of working group 1 is to develop a high spatial resolution ASL protocol. To see what the current status is and to challenge the members to think outside of the box, working group 1 organised an ASL-challenge on who could make the high resolution ASL-image of the posterior cingulate cortex in 10 minutes. In the end, 6 groups participated in the challenge, clearing showing the possible approaches that can be further optimised in the next period. Furthermore, it was decided that this challenge will remain open, i.e. all other groups can still try to improve upon the winning image quality.

Working group 2: Image processing analysis for ASL

The aims of WG2 at this meeting were both ambitious but also important at this early stage of proceedings: to give an overview of the key aspects of ASL quantification and a survey of the existing methods and experience within the action. A major aim of this was to provide a good idea to the other WGs of what might be possible with the expectation that this would feedback into the design of trials and the appropriate choice of acquisition sequence based on what information we wanted to extract from the data.

It was noted that the programme for WG2 already showed evidence of fruitful interaction between different groups within the action along with much future potential. The programme was divided in two firstly addressing key steps that were necessary for any ASL analysis followed by a more advanced section where we could look at more novel possibilities that might be of interest to the action.

ASL pipeline: This half addressed key concepts of perfusion quantification common to all acquisition strategies and included: Kinetic modeling, estimation of arterial magnetization, partial volume effects and group analysis. This section was to highlight key information required and methods available for 'routine' ASL quantification.

Advanced ASL topics: This half addressed what might be possible with ASL, but is dependent upon the acquisition methodology. This included: model-based inference, sparse methods and model-free methods. The intention of this was to highlight some of the latest methods and research as possibilities of use by the action.

A further theme of the WG2 session was to highlight existing software tools and work in progress that make ASL quantification more readily accessible. These included an IDL toolbox for QUASAR data, a new toolbox in the FMRIB software library and the ASL-App in development using MeVisLab.

Working group 3: Clinical applications for ASL

Each participant of WG3 was asked in advanced to prepare a case report to illustrate the use of ASL and from this case report to discuss problems and possible solutions to improve the use of ASL in the diagnosis and therapeutic follow-up of AD.

Several case reports were presented and in the discussion, several propositions for help from WG1 and WG2 were discussed. One of the important issues is that measurement and data treatment are not yet standardized.

Finally, it was proposed to start a small scale multicenter study of ASL in the diagnosis of minimal cognitive decline and AD. In order to organize this, each participating centre will communicate their sequence parameters, and WG1 and WG2 will deliver optimized parameter settings in order that data are comparable between the different participating centers. From the moment these parameters are available, this small scale study will start with the scanning of some normal subjects, and the data will be evaluated by members of WG1 and WG2.

Programme of the workshop

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| 07:30 – 08:30 | Registration |
| 08:30 – 08:40 | Welcome and introduction
Chairs: X. Golay & M. Guenther |

- 08:40 – 10:10 Session WG 1: MRI acquisition schemes for ASL
Chair: M. van Osch
- 10:10 – 10:25 Coffee break
- 10:25 – 12:00 Session WG 2: Image processing analysis for ASL
Chair: S. Ourselin
- 12:00 – 13:30 Lunch including the poster session
- 13:30 – 15:00 Session WG 3: Clinical applications for ASL
Chair: R. Achten
- 15:00 – 15:15 Coffee break
- 15:15 – 16:30 Keynote Lecture
Invited speaker: Prof. John A. Detre
Chair: X. Golay
- 16:30 – 17:00 Round Table Discussion and Wrap up
Participants: Xavier Golay, Thijs van Osch, Sebastian Ourselin, Rik Achten
Chair: M. Guenther
- 17:00 Closing