Evaluating the Reproducibility of 3.0 Tesla MRI Continuous Arterial spin labeling in the Assessment of Cerebral Perfusion

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Our primary objective is: To assess the reproducibility of CASL at 3.0T MRI in order to get an insight in the applicability of CASL in daily clinical routine in the AMCOur secondary objectives are:To assess whether the standard CASL sequence could…

Ethical review	Approved WMO
Status	Pending
Health condition type	Central nervous system vascular disorders
Study type	Observational non invasive

Summary

ID

NL-OMON32170

Source
ToetsingOnline

Brief title
EuReCA

Condition

- Central nervous system vascular disorders

Synonym
blood flow, cerebral blood flow

Research involving
Human

Sponsors and support

Primary sponsor: Academisch Medisch Centrum

Source(s) of monetary or material Support: Ministerie van OC&W

Intervention

Keyword: brain perfusion, continuous arterial spin labeling, reproducibility

Outcome measures

Primary outcome

Cerebral Blood Flow (ml per 100 grams of brain tissue per minute)

Secondary outcome

Cerebral Blood Flow (ml per 100 grams of brain tissue per minute) (mean whole brain Cerebral Blood Flow; mean Cerebral Blood Flow men and women; mean Cerebral Blood Flow left and right hemisphere)

Repeatability indices for CASL measurement of cerebral blood flow

Intraclass Correlation Coefficient for repeated measurements

Standard deviation of the paired difference between repeated measurements

Convergence of the difference of successive CASL measurements of cerebral blood flow when reducing the amount of acquisition averages.

Study description

Background summary

Measurement of cerebral blood flow (CBF) provides useful information about cerebrovascular sufficiency and regional metabolism. Arterial spin labeling

(ASL) is a non-invasive magnetic resonance imaging (MRI) technique for the quantification of cerebral perfusion. ASL does not involve exposure to ionizing radiation or radioactive isotopes. Therefore, it is an attractive tool compared to standard clinical methods, especially in the pediatric population and in longitudinal studies with repeated measurements.
During the recent years, technical improvements have been made and sequences have been implemented. These are generally classified as continuous arterial spin labeling (CASL) or pulsed arterial spin labeling (PASL). ASL is based on magnetic labeling of arterial blood water protons, which are subsequently used as an endogenous tracer. Magnetic inversion takes place in a plane proximal to the brain. Labeled blood water spins move towards the brain microvasculature. They have a decay rate of T1, which is sufficiently long to visualize perfusion of brain tissue and brain microvasculature. Perfusion contrast is obtained by subtraction of successively acquired labeled images and control images in which no labeling of arterial blood water spins is performed . Multiple acquisitions are averaged to improve the signal to noise ratio (SNR) and the final perfusion signal. In order to obtain sufficient perfusion signal effect, ASL sequences commonly consist of 40 to 60 paired acquisitions of labeled and controlled scans.
The low perfusion signal is one of the concerns in the reproducibility of CASL. Previously described CASL reproducibility studies were performed at 1.5 Tesla MR scanners. Careful search of literature did not yield any information on CASL reproducibility at 3.0 Tesla MRI. We suppose that a higher magnetic field strength will ameliorate the signal to noise ratio (SNR) and thus have a positive influence on reproducibility of CBF measurements. In case of a better SNR, fewer acquisitions might suffice to accurately measure CBF. This could reduce the total scan duration and the chance of movement between the subsequent acquisitions and thus improve the clinical applicability of ASL. Therefore the aim of this study will be to assess the inter- and intrasession reproducibility of CASL and the convergence of CASL data at 3.0 Tesla MRI.

Study objective

Our primary objective is:
To assess the reproducibility of CASL at 3.0T MRI in order to get an insight in the applicability of CASL in daily clinical routine in the AMC

Our secondary objectives are:
To assess whether the standard CASL sequence could be shortened by using less signal averages for the calculation of CBF
To compare mean CBF in the left and the right hemisphere
To compare mean CBF in men and women

Study design

For studying the inter-scan reproducibility and convergence of CASL, we will

measure CBF on three different occasions in a period of 3 weeks. To assess the intra-scan reproducibility and convergence of CASL, we will perform 2 CASL scans during each session.

Study burden and risks

This study is conducted using a non-invasive imaging modality: MRI. There is no risk associated with participation. If abnormalities on the MR images are apparent, a specialist will be consulted.

Contacts

Public
Academisch Medisch Centrum

Meibergdreef 9
1105 AZ Amsterdam
Nederland
Scientific
Academisch Medisch Centrum

Meibergdreef 9
1105 AZ Amsterdam
Nederland

Trial sites

Listed location countries

Netherlands

Eligibility criteria

Age
Adults (18-64 years)
Elderly (65 years and older)

Inclusion criteria

healthy volunteers aged between 20 and 35

Exclusion criteria

The presence of metal in the body (e.g. osteosynthetic material, pacemaker, artificial cardiac valves); claustrophobia; surgery performed in the area of measurement; known or symptomatic brain disease.

Study design

Design

Study type: Observational non invasive

Masking:	Open (masking not used)
Control:	Uncontrolled
Primary purpose:	Diagnostic

Recruitment

NL

Recruitment status:	Pending
Start date (anticipated):	01-05-2008
Enrollment:	10
Type:	Anticipated

Ethics review

Approved WMO

Application type:	First submission
Review commission:	METC Amsterdam UMC

Study registrations

Followed up by the following (possibly more current) registration

No registrations found.

Other (possibly less up-to-date) registrations in this register

No registrations found.

In other registers

Register	ID
CCMO	NL22574.018.08