Standardization of brain atrophy measurement in MS patients

Published: 01-06-2016
Last updated: 19-04-2024

The goal of the project is to validate the developed standardized atrophy measurement method at VU University Medical Centre in patients with MS. This is done by testing how well the measurements of atrophy agree between different scanners and...

Ethical review	Approved WMO
Status	Recruitment stopped
Health condition type	Demyelinating disorders
Study type	Observational non invasive

Summary

ID

NL-OMON43474

Source
ToetsingOnline

Brief title
StandardAMS

Condition

- Demyelinating disorders

Synonym
Multiple Sclerosis

Research involving
Human

Sponsors and support

Primary sponsor: Vrije Universiteit Medisch Centrum
Source(s) of monetary or material Support: Novartis,Novartis Pharma B. V.

Intervention

Keyword: Atrophy, MRI, Multiple sclerosis (MS)

Outcome measures

Primary outcome

Quantitative measures (median absolute difference, limits of agreement) of the inter-scanner and intra-scanner variability of measurements of the 1-year volume change of putamen, caudate nucleus, and the entire cerebrum using the new, standardised method.

Secondary outcome

The same quantitative measures of reproducibility for other, widely used methods to measure the volume change, specifically for the software Siena, FIRST and FreeSurfer.

Study description

Background summary

In multiple sclerosis (MS), next to other pathophysiological effects, the brain structures shrink. This shrinkage, which is also called atrophy depends relatively strongly to the disease severity and the degree of cognitive decline. It is unclear exactly which disease processes are responsible for this decline. Therefore, there are ongoing studies to better understand the disease as well as finding suitable drugs that can protect the brain against this shrinkage. Therefore, an accurate measure of the rate at which brain structures in MS patients shrink is demanding. With MRI (Magnetic Resonance Imaging) measurement of the atrophy rate is in principle possible, but because the results of these measurements differ between scanners and scanner settings, it is currently not possible to compare different measurements with each other. In VUmc, using a proof-of-concept grant from the NCA Brain Imaging Technology program, a method has been developed to measure the rate of atrophy in the brain of people with MS. In this method, the atrophy measurement is standardized using "conventional" MRI images.

Study objective

The goal of the project is to validate the developed standardized atrophy measurement method at VU University Medical Centre in patients with MS. This is done by testing how well the measurements of atrophy agree between different scanners and scanner settings, for three structures: putamen, caudate nucleus and the cerebrum as a whole.

Study design

To evaluate the developed method, 25 MS patients and 10 healthy controls will be scanned at baseline and after one year. Because this is the first application of this new technology, a fairly extensive scan protocol is used and all participants are scanned at three different MRI scanners. This is necessary to examine the comparability between different MRI scanners. This involves three different MRI scanners, all with a field strength of 3 Tesla, but from different manufacturers: GE, Philips and Toshiba. These scanners are available in the outpatient clinic of VUmc.
The scan protocol is repeated after one year and participation in this follow-up is crucial to detect small changes that have taken place in a year. All MR images will be produced without the administration of MRI contrast agent and no invasive procedure or administration of drug is performed. Standardization of the atrophy measurement will be followed by volunteers' measurements based on additional MRI measurements performed on our standard model (phantom). A patent application for this standardization model is currently being prepared. Briefly, it involves imaging of home-built objects (MRI phantoms) from which calibration information is obtained.

1. Scan and re-scan, scanner number one.
2. scan and re-scan, scanner number two.
3. scan and re-scan, scanner number three.

Each scan and re-scan takes about 40 minutes. We perform MRI scans at 3 different scanners. At any MRI, scanning takes up to 80 minutes, with a break half way in which the subject briefly gets off the scanner. The scheduling of the different MRI scans of one visit is done in consultation with participants and based on availability of MRI for research. The scans of a single visit can all be made on the same day or be spread over two or more days. The total duration of the MRI scans for one visit (i.e. at all three MRI scanners) will not exceed four hours. Because each scan also requires some preparation and different MRI scanners may not always be available immediately, the total duration of the visit may be longer.

Intra- and inter-scan reproducibility will be quantified by the median absolute difference, as well as limits of agreement based on linear mixed model analysis. These analyses will be conducted for the atrophy measured by both the

new method and by the automated methods such as SIENA, FIRST and Free Surfer.

Study burden and risks

No risks are associated with MRI acquisition and no immediate benefits are expected for the patients. However, it is worth mentioning that any unexpected findings, according to the *Toevalsbevindingen protocol* Hulst 2011, will be reported to the treating specialist and the family doctor of the patients and healthy controls, respectively.

Contacts

Public
Vrije Universiteit Medisch Centrum

De Boelelaan 1118 1118
Amsterdam 1081 HZ
NL
Scientific
Vrije Universiteit Medisch Centrum

De Boelelaan 1118 1118
Amsterdam 1081 HZ
NL

Trial sites

Listed location countries

Netherlands

Eligibility criteria

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

Inclusion criteria

MS patient group:
1. Diagnosis of relapsing-remitting, secondary progressive, or primary progressive MS.
2. 18 to 70 years old.
3. Written informed consent;Healthy controls:
1. 18 to 70 years old.
2. Written informed consent

Exclusion criteria

1. Inability to undergo MRI, e.g. metal objects in or around the body, claustrophobia or inability to lie still in the scanner.
2. Pregnant
3. Any (relevant) neurological disease (for healthy subjects).

Study design

Design

Study type:	Observational non invasive
Intervention model:	Other
Allocation:	Non-randomized controlled trial
Masking:	Open (masking not used)

Primary purpose: Diagnostic

Recruitment

NL

Recruitment status:	Recruitment stopped
Start date (anticipated):	20-10-2016
Enrollment:	35
Type:	Actual

Ethics review

Approved WMO

Date:	01-06-2016
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	NL55598.029.15