The cardiac contribution to cerebral perfusion - 'the heart-brain axis'

Published: 28-05-2013
Last updated: 24-04-2024

Answering the question about the influence of ageing on the relationship between systemic flow and pressure on the one hand and cerebral perfusion on the other hand.

Ethical review	Approved WMO
Status	Recruitment stopped
Health condition type	Vascular hypertensive disorders
Study type	Observational invasive

Summary

ID

NL-OMON41298

Source
ToetsingOnline

Brief title
Cardiac contribution to cerebral perfusion

Condition

- Vascular hypertensive disorders

Synonym
circulation; 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: cardiac output, cerebral perfusion

Outcome measures

Primary outcome

The primary end-points of this study are systemic blood flow and cerebral

perfusion.

Secondary outcome

- Blood pressure

- Cardiac output

- Age

- Cerebrovascular reactivity

Study description

Background summary

Cardiovascular disease is associated with loss of cognitive functioning. Both conditions are more common in elderly people. The condition of the heart and the large vessels determines the flow of blood to the brain and we suppose a larger role of the heart than previously is assumed. According to the traditional paradigm of cerebrovascular autoregulation in humans, the cerebral perfusion (e.g. cerebral blood flow (CBF)) is largely influenced by the cerebral perfusion pressure (CPP). The CPP, in turn, mainly depends on changes in cerebrovascular resistance. According to the classical model of autoregulation, CBF is maintained constant within a wide range of CPP. However, we and others have demonstrated in the past period that a decline in perfusion pressure within the cerebral autoregulatory range can lead to a decrease in CBF.
The prevalence of cardiovascular disease in relation to cognitive decline increases with age. Knowledge about the effect of ageing on the relationship between systemic (baroreflex) and cerebrovascular control mechanisms (mechanic- and chemo regulation), CPP and systemic blood flow is, however, incomplete. This impedes the development of new therapeutic strategies about treatment and prevention of loss of cognitive functioning. This study investigates the effect of ageing on the relationship between the systemic and cerebrovascular circulation combining state of the art techniques (ultrasound, ultra-high field (3T) MRI).

Study objective

Answering the question about the influence of ageing on the relationship between systemic flow and pressure on the one hand and cerebral perfusion on the other hand.

Study design

Before the start of the study (study phase), the subjects will be medically screened. This study consists of two pilot- and one study phase. In the first pilot phase, the different protocols as described in the study phase will be tested (inlcuding LBNP and handgrip exercise). During the second pilot phase, we will refine the protocol and investigate the reproducibility. In both the pilot as in the study phase, the same protocols will be tested and the same parameters will be measured.

The cerebral perfusion is evaluated in both the AMC Laboratory for Clinical Cardiovascular Physiology and in the LUMC Gorter center. Brain blood flow (velocity) will be qualified with Doppler ultrasound and ASL (arterial spin labeling) techniques on two different measurement days. Subsequently, the (baroreflex mediated) sympathetic and parasympathetic cardiovascular control will be compared in both young and elderly subjects during postural load together with quantification of the cerebrovascular mechanic- and chemoregulation.

Study burden and risks

There are no foreseen risks with participating in this study (for both pilot as study phase). The burden for the subject is minimal because almost all measurements done in this study are non-invasive (except for MRI meausurements). The physical load of the routine tests in this study is generally well tolerated. During the entire study, the subject will continuously be monitored to ensure subjects safety. The medical screening prior to the study is of great scientific interest. There are also no foreseen risks during the medical screening.

Contacts

Public
Academisch Medisch Centrum

Meibergdreef 9
Amsterdam 1105 AZ
NL

Scientific
Academisch Medisch Centrum

Meibergdreef 9
Amsterdam 1105 AZ
NL

Trial sites

Listed location countries

Netherlands

Eligibility criteria

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

Inclusion criteria

* Age between 18 to 30 years (younger subjects), age between 50 to 60 years (older subjects) or age 75 years and older (old subjects)

Exclusion criteria

* Frail elderly (presence of *3 criteria: weight loss, weakness, poor endurance/exhaustion, slowness, low physical activity)
* Medical history of CV disease, hypertension, diabetes mellitus, pulmonary disease, neurological disease, malignant disease and/or venous insufficiency
* Abnormal lab results (medical screening)
* Stenosis of (one of) the carotid arteries (retrospectively)
* Abnormal ECG (medical screening)
* Use of systemic medication
* Any cognitive impairment (MMSE>24 points)
* Contraindication to MRI exposure

Study design

Design

Study type: Observational invasive

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

Recruitment

NL

Recruitment status:	Recruitment stopped
Start date (anticipated):	06-06-2013
Enrollment:	86
Type:	Actual

Ethics review

Approved WMO Date:	28-05-2013
Application type:	First submission
Review commission:	METC Amsterdam UMC
Approved WMO Date:	25-06-2013
Application type:	Amendment
Review commission:	METC Amsterdam UMC
Approved WMO Date:	06-01-2014
Application type:	Amendment
Review commission:	METC Amsterdam UMC
Approved WMO Date:	16-05-2014
Application type:	Amendment
Review commission:	METC Amsterdam UMC
Approved WMO Date:	20-05-2015

Application type:	Amendment
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	NL44133.018.13