Brain Outcome after Cardiac Arrest - prediction

Published: 27-05-2019
Last updated: 10-04-2024

Primary objective Primary objective is to create a prediction model based on early clinical screening of motor, cognitive, and emotional disturbances to predict restrictions in participation at one year after cardiac arrest in patients that have...

Ethical review	Approved WMO
Status	Recruiting
Health condition type	Myocardial disorders
Study type	Observational non invasive

Summary

ID

NL-OMON55142

Source
ToetsingOnline

Brief title
BROCA - prediction

Condition

- Myocardial disorders

Synonym
cardiac arrest heart attack

Research involving
Human

Sponsors and support

Primary sponsor: Rijnstate Ziekenhuis
Source(s) of monetary or material Support: Hartstichting

Intervention

Keyword: Brain outcome, Cardiac arrest, Prediction

Outcome measures

Primary outcome

The primary outcome measure is *restrictions in participation* according to the restrictions subscale of the USER-P, dichotomized as *2 or more restrictions* vs. *0 or 1 restriction* at 12 months.

The International Classification of Functioning, Disability, and Health (ICF) is the WHO frame work for measuring health and disability. The ICF discriminates three levels of health related outcomes: functions, activities, and participation. Functional recovery in survivors after cardiac arrest largely manifests as societal participation. This concerns frequency of activi-ties, limitations/restrictions, and satisfaction about participation.28 These components are all included in USER-P. Internal consistency and discriminant validity of USER-P have been established in and outside the Netherlands amongst participants and patient groups with var-ious health conditions, including ischemic brain damage after cardiac arrest.28-30

Secondary outcome

Secondary outcome measures (i.e. predicted outcomes, i.e. dependent variables) are

- On the level of functioning: cognitive disturbances at 12 months defined as a com-posite score based on neuropsychological examination (NPE). NPE at 12 months comprises: MoCA (general cognitive functioning), Star Cancellation Test (perception), Boston Naming Test (language), Rey Auditory Verbal Learning Test

(memory), Trail Making Test part A & B (attention), Raven*s Advanced

Progressive Matrices (reason-ing), and Stroop Color and Word Test (executive

functioning).

- On the level of activities: frequency of activities according to the USER-P

at 6 and 12 months.

- On the level of participation: *restriction in participation* at 6 months.

Study description

Background summary

Brain damage after cardiac arrest: an increasing health care problem
Cardiac arrest is the primary cause of death and disability in the Western world. In the Netherlands alone, 16.000 persons are struck by a cardiac arrest each year. Epidemiological studies predict a rising incidence because of an increasing prevalence of cardiovascular risk factors and the aging population.1 Since the 1990s, survival rates of out of hospital cardiac arrest have increased considerably in the Netherlands, from 16% in 2006 to 23-27% in 2016, to even 41% in patients with a shockable rhythm. The exemplary increase in survival in the Netherlands is related to national programs targeting awareness of signs of cardiac arrest, education of basic life support to a wide range of civilians, and dense networks of automated external defibrillators throughout the country.2-4
In sharp contrast with increased survival, neurological outcome of cardiac arrest survivors has changed only marginally over the past decades. Of those surviving up to hospital admission, more than three quarters (approximately 5000 patients/y) initially remain comatose as a result of diffuse anoxic-ischemic brain damage. Half of comatose patients die in the hospital. Disturbances of motor functioning, cognition, mood, and functional impairments have been recognized in up to 100% of survivors.5,6 Diagnosis and treatment are focused on cardiac functioning, while brain damage and neurological impairments are addressed infrequently and not systematically.7

Acute phase: comatose patients after cardiac arrest
With previous studies, we addressed prognosis and treatment of brain damage in the acute phase after cardiac arrest. In this stage, most patients are comatose. With prospective multicenter cohort studies, we have shown that continuous EEG (cEEG) measures contribute to prediction of outcome in terms of awakening from coma and functional recovery.8-11 This has resulted in inclusion

of cEEG in guidelines and implementation of cEEG in many hospitals, worldwide. We currently investigate additional predictive values of advanced MRI techniques in comatose patients,12 and test treatments with anti-epileptic drugs and ghrelin to improve functional recovery in randomized controlled clinical trials.13,14

Chronic phase: high incidence of cognitive and emotional disturbances
In a Dutch cohort of cardiac arrest survivors, at 1 year after the incident, the incidence of cognitive disturbances was 22-29%, of posttraumatic stress 28%, of anxiety and depression 15%, and of severe fatigue 52%.15 Half of all patients could not resume daily activities and three quarters showed disturbances of participation in society.16 Cognitive impairments were strongly related to reduced participation and reduced quality of life.17

No validated tools for prediction of cognitive disturbances or functional recovery
Early recognition of disturbances of motor functioning, cognition, or mood would allow better guidance of patients, and open avenues for targeted treatments. However, there is no validated work up for diagnosis or prediction of such disturbances, nor for the subsequent functional impairments. In some hospitals, multidisciplinary screening programs analogous to those in patients with ischemic stroke are used, but these are not tested in patients after cardiac arrest. The Montreal Cognitive Assessment (MoCA) has been proposed for detection of cognitive impairments18 and is tested by the group of van Heugten and Verbunt in Limburg. Psychiatric disturbances have been recognized, but reports on early screening are lacking.19,20 Prediction models for functional recovery or participation are lacking.
MRI and EEG measurements of brain structure or functioning hold potential to contribute to estimation of the nature and severity of brain damage. However, after recovery of consciousness, EEG and MRI are not systematically included in the work up of postanoxic encephalopathy (i.e. diffuse brain damage after cardiac arrest). This is in sharp contrast to almost every other organic brain disease, where imaging is the cornerstone of diagnosis. Since disturbances of synaptic connectivity and cerebral network functioning are key pathophysiological mechanisms in postanoxic encephalopathy21-25 and also important for cognitive26 and mood outcomes,27 new EEG and MRI approaches focusing on cerebral network functioning hold potential to contribute to prediction of disturbances of cognition and mood. However, studies on MRI or EEG (network) analysis in relation to motor, cognitive, or emotional impairments, and consequent disabilities, of cardiac survivors are lacking.

General aims of the current study
With this study, we aim to establish a prediction model consisting of early clinical parameters to predict neurological functional recovery of patients after cardiac arrest that have survived the acute phase and awakened from coma. Also, we will study additional predictive values of MRI and EEG measures.

Study objective

Primary objective
Primary objective is to create a prediction model based on early clinical screening of motor, cognitive, and emotional disturbances to predict restrictions in participation at one year after cardiac arrest in patients that have survived the acute phase and awakened from coma.

Secondary objectives
Secondary objectives include:
• To create a prediction model based on early clinical screening to predict cognitive disturbances at one year
• To create a prediction model based on early clinical screening to predict level of activities at one year
• To study additional predictive values of EEG and MRI measurements

Study design

This will be a prospective, longitudinal cohort study on 200 patients after cardiac arrest, ad-mitted on cardiac care units or cardiology departments. Patients will be included, and clinical, MRI, and EEG measures of brain damage will be collected at 4±3 weeks after cardiac arrest. In case of ICD implantation before MRI data is collected, MRI will be postponed to 6 weeks after ICD implantation (within 9 weeks after cardiac arrest). Follow up will be one year. The study will start in Rijnstate Hospital, Arnhem. Various other academic and non-academic hospitals have expressed the intention to participate and will be added as participating centers later, by amendments.

Study burden and risks

Potential risk
We foresee no additional risk of clinical screening, MRI, or EEG measurements.

Potential benefit
Potential benefit from participating in this study is careful follow up, with the possibility to identify and discuss signs of cognitive or emotional disturbances, that would otherwise have remained uncovered.

Contacts

Public
Rijnstate Ziekenhuis

Wagnerlaan 55

Arnhem 6815AD
NL
Scientific
Rijnstate Ziekenhuis

Wagnerlaan 55
Arnhem 6815AD
NL

Trial sites

Listed location countries

Netherlands

Eligibility criteria

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

Inclusion criteria

• Age >=18 years
• Out of hospital cardiac arrest
• Successful cardiopulmonary resuscitation 4±3 weeks ago
• GCS score >8
• Admission to cardiac care or cardiology department
• Written informed consent obtained

Exclusion criteria

• Primary cause of arrest is choking or hanging.
• Cardiac arrest and resuscitation started in the ambulance, on the way to the hospital, with return of spontaneous circulation and consciousness upon arrival at the hospital.
• Preexistent brain damage with mRS>2
• Known progressive neurodegenerative disease
• Life expectancy of less than three months as a result of another medical condition.
• Need of intravenous sedative medication

• Patients with an MRI incompatible Implantable Cardioverter Defibrillator (ICD) may be excluded from the MRI protocol, depending on the ICD type. These patients can be included in the remainder of the study
• Insufficient knowledge of the Dutch language to fill out questionnaires.

Study design

Design

Study type: Observational non invasive

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

Recruitment

NL

Recruitment status:	Recruiting
Start date (anticipated):	05-11-2019
Enrollment:	200
Type:	Actual

Ethics review

Approved WMO Date:	27-05-2019
Application type:	First submission
Review commission:	CMO regio Arnhem-Nijmegen (Nijmegen)
Approved WMO Date:	11-11-2019
Application type:	Amendment
Review commission:	CMO regio Arnhem-Nijmegen (Nijmegen)
Approved WMO Date:	07-04-2020
Application type:	Amendment
Review commission:	CMO regio Arnhem-Nijmegen (Nijmegen)

Approved WMO Date:	27-07-2020
Application type:	Amendment
Review commission:	CMO regio Arnhem-Nijmegen (Nijmegen)
Approved WMO Date:	23-02-2021
Application type:	Amendment
Review commission:	CMO regio Arnhem-Nijmegen (Nijmegen)

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	NL69767.091.19