Zooming in on cerebral abnormalities in severely affected COVID-19 patients: a 3T and 7T MRI study

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Ethical review	Approved WMO
Status	Recruiting
Health condition type	Neurological disorders NEC
Study type	Observational invasive

Summary

ID

NL-OMON53824

Source
ToetsingOnline

Brief title
ZoomCOVID

Condition

- Neurological disorders NEC
- Respiratory tract infections

Synonym
corona disease, COVID-19 infection

Research involving
Human

Sponsors and support

Primary sponsor: Medisch Universitair Ziekenhuis Maastricht
Source(s) of monetary or material Support: Ministerie van OC&W

Intervention

Keyword: Cerebral abnormalities, COVID-19, Intensive Care Unit, MRI

Outcome measures

Primary outcome

Radiological outcome at 12-24 months follow-up: MRI abnormalities, focussing on vascular abnormalities and olfactory tractus (3T MRI), and glymphatics and the brainstem (7T MRI). Neurological outcome: residual neurological symptoms (including smell/taste) and functional status at follow-up. Clinical outcome: severity of disease scores, (serial) factors of hypercoagulability and inflammation during ICU admission, neurological and cardiovascular (arterial/venous) complications during hospital admission.

Secondary outcome

Neuropsychological outcome: global deficits in cognitive and neurological functioning, objective changes in or loss of smell/taste and residual signs of inflammation and hypercoagulopathy at follow-up.

Study description

Background summary

Brain injury is one of the complications in COVID-19 intensive care unit (ICU) survivors, though the precise underlying mechanism is unclear. It is likely caused by a combination of prolonged hypoxia, a massive systemic inflammatory response, direct infection of the brain and small vessel vasculitis in combination with widespread hypercoagulopathy and thrombosis. Using novel MRI techniques, blood-brain barrier (BBB) permeability, as well as other microstructural and microvascular properties of the brain tissue, will be assessed non-invasively in COVID-19 ICU survivors approximately one year after ICU admission and compared to serial clinical and laboratory measurements of hypercoagulation and inflammation during the (ICU) admission. Moreover,

measures from the COVID-19 ICU survivors will be compared to an ICU control group (without COVID-19) to gain insight into how specific the observed abnormalities are to the Sars-CoV-2 virus or if these are also found in ICU patients without COVID-19.

Study objective

This study aims to relate factors of hypercoagulability, inflammation or general illness itself (all during ICU admission) to microstructural and microvascular abnormalities on follow-up brain advanced 3T and 7T MRI in COVID-19 ICU survivors. By gaining more insight into the pathogenesis of brain injury, the treatment of COVID-19 patients in the acute phase might be improved.

Study design

Mono-center follow-up cohort study with measurements at 12-24 months post hospital discharge. The main measurements include MRI scans, primarily focusing on microstructural and microvascular abnormalities in the brain, and (previously collected) parameters of hypercoagulability and inflammation during ICU admission.

Study burden and risks

Patients will undergo an MRI scan (3T) and optionally a second MRI scan (7T) of approximately 60 minutes each. The 3T scan will include intravenous gadolinium-based contrast administration. Risks concerning contrast agent administration will be negligible, as patients with an impaired renal function (eGFR< 30 ml/min) are excluded from the study. For the 7T scan use of the contrast agent is not required. The 7T scan will lead to insights, additional to the 3T scan, in possible effects of a severe COVID-19 infection on the brainstem and the glymphatic system.
Additional burden of approximately 1.5 hour consists of a short neuropsychological test examination and two short questionnaires of cognitive, neurological olfaction and functional status, smell and taste testing and one venepuncture for blood collection (29ml) and infusion line for contrast agent administration.
Patients will not benefit directly from participation in this study. However, to learn more about the neurological sequelae of a severe COVID-19 infection (with focus on inflammation and hypercoagulation markers), it is necessary to perform high quality brain imaging in ICU survivors.

Contacts

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Trial sites

Listed location countries

Netherlands

Eligibility criteria

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

Inclusion criteria

COVID-19 ICU survivors:
- Proven COVID-19 infection for which they were admitted to ICU for at least 3 days
- Included in the MaastrICCht cohort (a large database of serial measurements collected during ICU stay from patients with COVID-19 admitted to the ICU in het Maastricht University Medical Centre+; METC 2020-1565/3 00 523)
- Age >= 18 years
- Informed consent
- Sufficient command of the Dutch language to follow test instructions and understand the information letter, informed consent, and questionnaires

ICU survivors:

- Admission to the intensive care unit at the Maastricht UMC+ for at least 3 days
- Reason for ICU admission: severe infection (bacterial, viral, fungal) with respiratory insufficiency
- If tested for COVID-19 on ICU, negative PCR test result; if not tested for COVID-19 on ICU, no suspicion for COVID-19 positive infection
- Age >= 18 years
- Informed consent
- Sufficient command of the Dutch language to follow test instructions and understand the information letter, informed consent, and questionnaires

Exclusion criteria

COVID-19 ICU survivors:
- Objective cognitive impairments before the hospital admission for the COVID-19 infection
- An unexpected incident leading to severe neurological damage after hospital discharge (such as stroke or traumatic brain injury)
- Contra-indications for MRI scanning (e.g. metal implants, cardiac pacemaker, claustrophobia, pregnancy and tattoos in the head/neck region)
- Unwillingness to be informed about clinical relevant (abnormal) MRI-findings
- Physical inability to travel to one of the locations (e.g., bedridden patients)

ICU survivors:
- Positive COVID-19 PCR test during ICU admission
- Objective cognitive impairments before the ICU admission
- An unexpected incident leading to severe neurological damage after hospital discharge (such as stroke or traumatic brain injury)
- Contra-indications for MRI scanning (e.g. metal implants, cardiac pacemaker, claustrophobia, pregnancy and tattoos in the head/neck region)
- Unwillingness to be informed about clinical relevant (abnormal) MRI-findings
- Physical inability to travel to one of the locations (e.g., bedridden patients).

Study design

Design

Study type:	Observational invasive
Intervention model:	Other

Allocation:	Non-randomized controlled trial
Masking:	Open (masking not used)
Control:	Active
Primary purpose:	Basic science

Recruitment

NL

Recruitment status:	Recruiting
Start date (anticipated):	20-06-2022
Enrollment:	105
Type:	Actual

Ethics review

Approved WMO Date:	19-04-2022
Application type:	First submission
Review commission:	METC academisch ziekenhuis Maastricht/Universiteit Maastricht, METC azM/UM (Maastricht)
Approved WMO Date:	30-12-2022
Application type:	Amendment
Review commission:	METC academisch ziekenhuis Maastricht/Universiteit Maastricht, METC azM/UM (Maastricht)
Approved WMO Date:	15-05-2023
Application type:	Amendment
Review commission:	METC academisch ziekenhuis Maastricht/Universiteit Maastricht, METC azM/UM (Maastricht)
Approved WMO Date:	08-02-2024
Application type:	Amendment
Review commission:	METC academisch ziekenhuis Maastricht/Universiteit Maastricht, METC azM/UM (Maastricht)

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	NL79868.068.21