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How well can scars of the heart muscle be seen and measured when using a reduced contrast dose for MRI imaging of the heart?

Submission date	**Recruitment status**	[_] Prospectively registered
26/07/2021	No longer recruiting	[X] Protocol
Registration date	**Overall study status**	[_] Statistical analysis plan
20/09/2021	Completed	[_] Results
Last Edited	**Condition category**	[_] Individual participant data
20/09/2021	Circulatory System	[_] Record updated in last year

Plain English summary of protocol

Background and study aim:
Myocardial scar is scarring of the heart muscle that occurs after some form of injury to the heart muscle such as a myocardial infarction (heart attack) or inflammatory heart disease as well as inherited disease of the heart muscle. Myocardial scar can impact the ability of the heart to pump blood around the body. Imaging and assessment of scars and fibrosis, particularly in the left ventricle (the main left chamber of the heart), are essential components of routine clinical practice in Cardiovascular magnetic resonance (CMR).

The aim of this study is to investigate whether imaging and quantification of myocardial scar using reduced contrast dose in late-gadolinium enhancement technique is possible.

Who can participate?:
Patients with a confirmed or suspected diagnosis of acute or chronic myocardial infarction or inflammatory heart disease or hypertrophic cardiomyopathy and a clinically indicated cardiac MRI examination with gadolinium-containing contrast agent according to the disease present.

What does the study involve:
For participants in this study, the routine MRI examination will be expanded by 3-5 min to include additional sequences. This will allow MRI images to be collected that can be used by the study team to compare how well the myocardial scar can be measured after using different imaging techniques.

What are the possible benefits and risks of participating?:
If the imaging of myocardial scarring using reduced contrast dose in late-gadolinium enhancement technique is shown to be equal to routine imaging techniques, then patients who have not undergone an indicated contrast-enhanced cardiac MRI examination as part of their care so far, or only after a delay (for example patients with severe chronic renal failure or with acute renal failure), could benefit from the added value of this examination in terms of identifying disease and possibly improving outcomes.

There is a lack of evidence that gadolinium contrast deposits in the central nervous system cause disease, however, a reduced contrast agent burden for each patient could cause a significant reduction in the incidence of nephrogenic systemic fibrosis (NSF). NSF is a rare disorder that occurs in some individuals with reduced kidney function, who have been exposed to intravenous contrast material that contains gadolinium.

Shorter examination times may also reduce waiting times for an MRI examination or increase productivity per MRI scanner. Likewise, the time burden on individual patients can be reduced.

It is not expected that the study-related extension of the examination by 3-5 min in a total examination time of 30-45 min anyway poses an additional risk. Since participants would be indicated for the MRI examination and the administration of contrast medium regardless of participation in this study, there are no foreseeable study-related burdens or risks for the study participants.

Where is the study run from?
Helios Clinics Berlin Buch (Germany)

When is the study starting and how long is it expected to run for?
From November 2020 to December 2023

Who is funding the study?
Working group Cardiovascular Magnetic Resonance, Charité Berlin Buch (Germany)

Who is the main contact?
Maximilian Fenski
maximilian.fenski@charite.de

Contact information

Type(s)
Scientific

Contact name
Mr Maximilian Fenski

ORCID ID
https://orcid.org/0000-0002-5943-305X

Contact details
Lindenberger Weg 80
Berlin
Germany
13125
+49 (0)1773186477
maximilian.fenski@charite.de

Additional identifiers

Protocol serial number

EA1/087/21

Study information

Scientific Title
Imaging and quantification of myocardial scars using reduced contrast dose in late-gadolinium enhancement technique by cardiovascular MRI (TWIN-CMR)

Acronym
TWIN-CMR

Study objectives
True "full-dose" (reference standard) and synthetic full-dose imaging show a diagnostically equivalent result in terms of myocardial scar tissue mass.

Ethics approval required
Old ethics approval format

Ethics approval(s)
Approved 19/05/2021, Charité Ethics Committee (Campus Berlin Mitte, Charitéplatz 1, 10117 Berlin, Germany; +49 030 450 517 266; no email contact available), ref: EA1/087/21

Primary study design
Observational

Study design
Prospective cross-sectional single-center trial

Study type(s)
Diagnostic

Health condition(s) or problem(s) studied
Imaging and quantification of myocardial scars in patients with acute or chronic myocardial infarction, inflammatory heart disease, or hypertrophic cardiomyopathy

Interventions
The routine MRI examination will be expanded to include the following sequences:
- T1-MOLLI- mapping short-axis images in breath-hold.
- T1-MOLLI mapping short-axis acquisitions in free breathing.
- Additional MOCO PSIR 2D LGE images in free respiration

Use of an artificial neural network in the area of software post-processing of acquired MRI images. Here, T1 mapping and conventional LGE acquisitions are performed at different time points (before KM administration, after first administration of KM, and two acquisitions after second KM administration).
By learning the pattern of T1 relaxation change over time with administration of lower doses of KM, an image impression (a so-called synthetic "full-dose recording") as achieved with higher doses of KM (true "full-dose recording") is potentially possible.

Intervention Type

Other

Primary outcome(s)
Scar mass measured using a semi-automatic thresholding-based approach (full width at half maximum) at a single timepoint (the time the MRI image was taken)

Key secondary outcome(s)
Synthetic full-dose recording performance compared to the reference standard measured by the signal-to-noise ratio and contrast-to-noise ratio of the MRI image at the single timepoint

Completion date
31/12/2023

Eligibility

Key inclusion criteria
1. Written consent of the patient prior to commencement of study-specific actions
2. Capable of giving consent and capable of understanding the nature and scope of the clinical trial
3. Aged ≥18 years
4. Confirmed diagnosis or suspected diagnosis of acute or chronic myocardial infarction, inflammatory heart disease, or hypertrophic cardiomyopathy
5. Clinically indicated cardiac MRI examination with gadolinium-containing contrast agent according to the disease present

Participant type(s)
Patient

Healthy volunteers allowed
No

Age group
Adult

Lower age limit
18 Years

Sex
All

Key exclusion criteria
1. Absolute contraindication to MRI examination (e.g. presence of metal implants, insulin pumps, pacemakers, ICDs, orbital foreign bodies, non-MRI cochlear implants, cerebral vascular clips)
2. Known allergy to MRI contrast media
3. Pregnant or breastfeeding
4. Have already participated in this study
5. Refusal to participate
6. Not capable of giving consent

Date of first enrolment

01/06/2021

Date of final enrolment
31/12/2023

Locations

Countries of recruitment
Germany

Study participating centre
Helios Clinics Berlin Buch
Schwanebecker Chaussee 50
Berlin
Germany
13125

Sponsor information

Organisation
Charité - University Medicine Berlin

Funder(s)

Funder type
Other

Funder Name
Working Group Cardiovascular Magnetic Resonance, Berlin Buch

Results and Publications

Individual participant data (IPD) sharing plan
The datasets generated during and/or analysed during the current study are not expected to be made available due to state data protection regulations.

IPD sharing plan summary
Not expected to be made available

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Participant information sheet	German language version v1.0	16/02/2021	27/07/2021	No	Yes
Protocol file	version MRI protocol	27/07/2021	27/07/2021	No	No