Non invasive investigation of the underlying cause of differences in metabolic capacity along the length of the tibialis anterior muscle using Magnetic Resonance

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To investigate if difference in fiber type and/or oxygen supply are the underlying cause for the difference in PCr recovery along the length of the tibialis anterior muscle.

Ethical review	Approved WMO
Status	Recruitment stopped
Health condition type	Musculoskeletal and connective tissue disorders congenital
Study type	Observational non invasive

Summary

ID

NL-OMON43213

Source
ToetsingOnline

Brief title
Metabolic capacity in the tibilias anterior

Condition

- Musculoskeletal and connective tissue disorders congenital
- Glucose metabolism disorders (incl diabetes mellitus)
- Muscle disorders

Synonym
N/A

Research involving
Human

Sponsors and support

Primary sponsor: Radboud Universitair Medisch Centrum
Source(s) of monetary or material Support: collectebusfondsen

Intervention

Keyword: Magnetic Resonance, metabolic capacity, perfusion, skeletal muscle

Outcome measures

Primary outcome

The main study parameters are the exercise PCr decline and post exercise

recovery, potential splitting of Pi peaks, end-exercise pH, muscle perfusion

via MRI and NIRS.

Secondary outcome

A secondary study parameter is the local strain measured with ultrasound.

Study description

Background summary

During skeletal muscle exercise the level of the energy buffer phosphocreatine (PCr) decreases. The recovery of the PCr level after exercise is considered to be a measure for the oxidative capacity of the exercising muscle. These PCr changes can be observed in vivo by 31P MR spectroscopy. The rate of PCr recovery varies between subjects (e.g. trained vs. untrained, elderly vs. young) and also between muscles. In recent years it has become clear that individual muscles are not a homogenous entity. For instance, we observed for the first time that the PCr recovery rate after an isometric exercise can also vary along the length of a muscle, i.e. in the tibialis anterior (TA). The reason for this apparent strong gradient in the PCr recovery rate may be because of a variation in oxidative capacity along the TA, for instance due to variable fibre type composition, but also because of differences in end-exercise pH and oxygen supply. Since our previous study showed no difference in end-exercise pH along the TA, the gradient in PCr recovery rate is either controlled by variable oxygen supply or by differences in true oxidative capacity, which may be due to a variable fibre type distribution. Therefore, we propose to investigate if fiber type composition and/or oxygen

supply play a role in the PCr recovery rate variation along the length of the TA. During exercise the peak for inorganic phosphate (Pi) in the 31P MR spectrum may split in two components which are assumed to reflect the dominant fiber types. Tissue perfusion can be assessed by so-called IVIM diffusion and blood oxygenation by T2* MRI and NIRS.

Study objective

To investigate if difference in fiber type and/or oxygen supply are the underlying cause for the difference in PCr recovery along the length of the tibialis anterior muscle.

Study design

Cross sectional study where we investigate the acute effect of muscle contraction within regions of the tibialis anterior on PCr recovery and muscle perfusion.

Study burden and risks

The proposed study is fully non-invasive. Therefore, burden and risk is minimal. The maximum duration of the MR experiment is 1,5 hour. Furthermore, the subject has to perform 3 times muscle contraction until exhaustion, which can be experienced as difficult. Both the duration of the MR experiment and muscle contraction are, according to our own experience, well tolerated by young healthy volunteers.

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

- healthy
- male
- Age between 18-35 years
- BMI between 19 and 25 kg/m2
- MR eligibility; verified using a questionnaire

Exclusion criteria

- MR ineligibility; verified using a questionnaire
-- inability to lay supine for 90 minutes

Study design

Design

Study type: Observational non invasive

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

Recruitment

NL

Recruitment status:	Recruitment stopped
Start date (anticipated):	15-06-2017
Enrollment:	15
Type:	Actual

Ethics review

Approved WMO Date:	20-03-2017
Application type:	First submission
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	NL60135.091.16