Non invasive investigation of the metabolic capacity of the tibialis anterior muscle using 31P magnetic resonance spectroscopy

Published: 23-07-2014 Last updated: 20-04-2024

To perform 31P-MRS during and after exercise using a specifically designed probe to determine variations in energy metabolism along the TA muscle in healthy humans subjects.

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

Summary

ID

NL-OMON40317

Source ToetsingOnline

Brief title 31P-MRS of tibialis anterior muscle

Condition

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

Synonym

N/A

Research involving Human

Sponsors and support

Primary sponsor: Universitair Medisch Centrum Sint Radboud **Source(s) of monetary or material Support:** Department of Radiology;radboudumc

Intervention

Keyword: in vivo, magnetic resonance spectroscopy, oxidative capacity, skeletal muscle

Outcome measures

Primary outcome

Main endpoint is the rate of PCr recovery after exercise for the different

regions of the TA muscle.

Secondary outcome

The utilization of PCr, the buildup of inorganic phosphate, and the effect of

exercise on pH during the muscle contractions are secondary endpoints. All

these parameters can be obtained from the same MR spectrum can therefore be

measured simultaneously.

Study description

Background summary

Skeletal muscle consists of basically two different fiber types, that are different in their metabolic capacities: Type I fibers are slowly contracting, their oxidative potential is high and they are resistant to fatigue. Type II fibers are fast contracting, their oxidative potential is low and they fatigue quickly. Invasive studies performed in rodents suggest that the fiber distribution varies along the length of many muscles including the tibialis anterior (TA) muscle. 31P magnetic resonance spectroscopy (MRS) can be used to noninvasively determine the muscle*s metabolic capacities during and after exercise. Specifically, the recovery rate of phosphocreatine (PCr) after exercise can be used to determine in vivo oxidative capacity of the muscle. Since the rate of PCr recovery is lower in type II compared to type I fibers, it is hypothesized that this parameter varies along the TA muscle in healthy

male volunteers.

Study objective

To perform 31P-MRS during and after exercise using a specifically designed probe to determine variations in energy metabolism along the TA muscle in healthy humans subjects.

Study design

In this study, we are testing the acute effects of muscle contractions within different regions of the same muscle (tibialis anterior).

Intervention

Muscle contractions inside the MR scanner will be used to disturb the metabolic steady state of the tibialis anterior. Non-invasive 31P-MRs will be performed before, during, and after these muscle contractions

Study burden and risks

The proposed study is fully non-invasive. Therefore, burden and risk is minimal.

However, the maximum duration of the MR experiment is relatively long (1.5h). However, we now from previous studies that this can relatively easily be tolerated by healthy subjects.

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

Potential volunteers must meet all of the following inclusion criteria: -healthy -male -young: between 18 to 35 years -BMI between 19 and 25 kg/m2 -MR compatibility is verified using a questionnnaire

Exclusion criteria

A potential subject who meets any of the following criteria will be excluded from participation in this study:

-Epilepsy or medication against epilepsy

-Subject is not MR compatible (e.g. because of pacemaker, claustrophobia, metal implants in the lower leg that may interfere with MRS, metal splinters in the eye)

Study design

Design

Study type: Observational non invasive		
Masking:	Open (masking not used)	
Control:	Uncontrolled	
Primary purpose:	Other	

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Recruitment

NL	
Recruitment status:	Recruitment stopped
Start date (anticipated):	05-02-2015
Enrollment:	15
Туре:	Actual

Ethics review

Approved WMO	
Date:	23-07-2014
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 CCMO **ID** NL47394.091.14