The effect of immobilization on myocellular characteristics in healthy, young males

Published: 23-09-2009
Last updated: 06-05-2024

To study the influence of physical inactivity, induced by leg immobilization, on muscle charateristics, satellite cell content and muscle protein synthesis rate.

Ethical review	Approved WMO
Status	Recruitment stopped
Health condition type	Muscle disorders
Study type	Interventional

Summary

ID

NL-OMON36909

Source
ToetsingOnline

Brief title
Leg immobilization in young males

Condition

- Muscle disorders

Synonym
Sarcopenia

Research involving
Human

Sponsors and support

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

Intervention

Keyword: Atrophy, Protein synthesis, Satellite cell, Skeletal muscle

Outcome measures

Primary outcome

Muscle charateristics and satellite cell content, at 0, 2 and 8 weeks after the

start of the intervention.

In addition, muscle protein synthesis rate will be determined at 0 en 2 wks.

Secondary outcome

Maximal strength

Cross-sectional area of the upper leg

Study description

Background summary

Aging is characterized by a decrease in skeletal muscle mass and strength, also known as sarcopenia. This age-related reduction in muscle mass and strength is associated with a decline in muscle function and performance. On a myocellular level, sarcopenia is characterized by a reduction in muscle fiber number and size, with specific type II muscle fiber atrophy. The age-related reduction in type II muscle fiber size is accompanied by a type II muscle fiber specific decline in satellite cell (muscle stem cell) content. In adult muscle, satellite cells are essential for myofiber growth, repair and regeneration. Thus, the reduction in satellite cell content with age could play an important role in the development of sarcopenia. In addition, apart from the essential role that SC play in the maintenance of skeletal muscle mass, day to day regulation of muscle mass is governed by an intricate balance between muscle protein synthesis and muscle protein breakdown . Of these, muscle protein synthesis has been shown to be the most susceptible to change. While basal muscle protein synthesis does not seem to change with age, it is now becoming apparent that the normal stimulation of muscle protein synthesis in response to feeding may become impaired with age. Thus, muscle loss with aging is likely to be a combination of the decline in SC number and/or the reduced stimulation of muscle protein synthesis to food.
In the present study we will investigate the effects of physical inactivity,

induced by leg immobilization, on muscle characteristics and satellite cell content in healthy, young males. The latter can give further insight into the role of satellite cells in inactivity induced muscle fiber atrophy and/or sarcopenia.

Study objective

To study the influence of physical inactivity, induced by leg immobilization, on muscle charateristics, satellite cell content and muscle protein synthesis rate.

Study design

During this study we will follow participants for a time period of 8 weeks. Following the first test day one leg will be immobilized by means of a cast, for a time period of 2 weeks. After 2 weeks of immobilization (on the second test day), the leg cast will be removed. On this test day we will assess the effects of the immobilization period. Finally, the third test day will be 6 weeks after cast removal, to assess the effects natural recovery.

Intervention

The intervention period is 2 weeks. During this period 1 leg will be immobilized by means of a leg cast.

Study burden and risks

At the site of the muscle biopsy a hematoma could occur. The muscle biopsy is performed by an experienced physician. The incision made for obtaining the muscle biopsy will heal completely. The biopsy scare will be assessed by a physician before the leg is casted. The immobilization period will lead to loss of muscle mass and strength in the immobilized leg. However, previous research has shown that this loss of muscular strength returns to pre-immobilized values within weeks after removal of the cast, without specific training. The radiation from the CT-scan is negligible becasue only one image ("single-slice) is taken and this on 0, 2 and 8 weeks of the intervention

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

Male
Age between 18 and 35 years old
BMI <= 30

Exclusion criteria

Use of medication that may affect haemostasis
Subjects with (recent) musculoskeletal/orthopaedic disorders known to affect the outcome of the study or that compromise their ability to walk with crutches.
Subjects with metal implants in their lower limbs
Subjects with known current cardiovascular disease
Subjects with cardiovascular disease in their history
Subjects with known current haemostatic disorders
Subjects with haemostatic disorders in their history;Previously experienced side effects of heparine-like coagulant medication
Blood loss from tractus digestivus (ulcus pepticum, tumor, hiatus hernia or diverticulosis)
Surgery of cerebrum, eyes or spinal cord during fraxiparine application period
Lumbar puncture during fraxiparine application period
Anaesthesia (regional or spinal) during fraxiparine application period

Renal dysfunction

Study design

Design

Study type: Interventional

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

Recruitment

NL

Recruitment status:	Recruitment stopped
Start date (anticipated):	01-11-2009
Enrollment:	15
Type:	Actual

Ethics review

Approved WMO

Date:	24-09-2009
Application type:	First submission
Review commission:	METC academisch ziekenhuis Maastricht/Universiteit Maastricht, METC azM/UM (Maastricht)

Approved WMO

Date:	18-04-2011
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
ClinicalTrials.gov	NCT00936039
CCMO	NL27212.068.09