Validation of estimated motor unit properties as obtained by inverse modelling of motor unit templates using high-density surface EMG

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To validate and determine the accuracy of an inverse model for determining motor unit properties based on high-density surface EMG measurements from biceps brachii and tibialis anterior muscles.

Ethical review	Approved WMO
Status	Pending
Health condition type	Muscle disorders
Study type	Observational invasive

Summary

ID

NL-OMON37533

Source
ToetsingOnline

Brief title
Validating motor unit properties

Condition

- Muscle disorders

Synonym
n.a.

Research involving
Human

Sponsors and support

Primary sponsor: Universitair Medisch Centrum Sint Radboud

Source(s) of monetary or material Support: Ministerie van OC&W

Intervention

Keyword: high-density EMG, inverse model, motor unit

Outcome measures

Primary outcome

Study parameters are: muscle fibre orientation, motor endplate zone, muscle fibre conduction velocity, muscle fibre length, and motor unit size as determined by various techniques.

Secondary outcome

n.a.

Study description

Background summary

Electromyography (EMG) measures the electrical activity of motor units which are the smallest controllable unit of the neuromuscular system. High-density surface electromyography uses a large number of small electrodes to cover the muscle and allows to determine both temporal and spatial information on individual motor units such as main muscle fibre orientation, muscle fibre conduction velocity, and motor endplate zone. So far, there is no validated method for extracting these motor unit properties. This especially concerns muscles with a pinnate muscle fibre structure.
This study aims at validating an inverse model for determining motor unit properties using experimentally obtained data from two different muscles (biceps brachii and tibialis anterior). For this purpose, high-density surface EMG is recorded with different electrode grid orientations. Intra-muscular fine wire EMG is simultaneously recorded. In this manner evaluation and tracing of identical motor unit potentials is controlled while the surface electrode grid is relocated. The motor unit variables extracted by the inverse model are compared to corresponding data obtained by independent methods (intramuscular fine wire and scanning EMG and muscle ultrasound). In addition, electrode grid displacement and re-orientation is monitored by metric and angular registration of electrode grid borders on landmarks and reference lines drawn on the skin.

Study objective

To validate and determine the accuracy of an inverse model for determining motor unit properties based on high-density surface EMG measurements from biceps brachii and tibialis anterior muscles.

Study design

Observational study of explorative nature

Study burden and risks

Two muscles are examined using muscle ultrasound, fine wire EMG, scanning EMG and high-density surface EMG. The techniques used are well established and cause no risk to the subject. The fine wire electrodes will only cause discomfort during insertion which is comparable with a muscular injection. The wires are hardly noticed after the needle is retracted. The scanning EMG needle is a standard EMG needle which causes some discomfort during the scanning measurement which takes about two minutes. The total time required for the experiment is estimated to be 2 hours. The participating subject will receive 50 euro as compensation for time and discomfort.

Contacts

Public
Universitair Medisch Centrum Sint Radboud

Postbus 9101
6500 HB Nijmegen
NL
Scientific
Universitair Medisch Centrum Sint Radboud

Postbus 9101
6500 HB Nijmegen
NL

Trial sites

Listed location countries

Netherlands

Eligibility criteria

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

Inclusion criteria

Healthy volunteers between 18 and 60 yrs

Exclusion criteria

neuromuscular disorder
blood clotting disorder
Obese subjects are unsuited as the surface EMG signals are strongly attenuated with distance.

Study design

Design

Study type: Observational invasive

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

Recruitment

NL

Recruitment status:	Pending
Start date (anticipated):	01-03-2012
Enrollment:	8
Type:	Anticipated

Ethics review

Approved WMO Date:	22-03-2012
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	NL39681.091.12