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Bone and muscle structure and function in relation to exercise and oestrogen replacement

Submission date	Recruitment status	[ ] Prospectively registered
11/06/2009	No longer recruiting	[ ] Protocol
Registration date	**Overall study status**	[ ] Statistical analysis plan
09/07/2009	Completed	[X] Results
Last Edited	**Condition category**	[ ] Individual participant data
09/07/2009	Musculoskeletal Diseases	

Plain English summary of protocol
Not provided at time of registration

Contact information

Type(s)
Scientific

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Additional identifiers

Study information

Scientific Title
Bone and muscle structure and function in relation to exercise and oestrogen replacement: a randomised double-blind placebo-controlled one-year-trial

Acronym
Ex/HRT-study

Study objectives

Deterioration of bone and muscle properties may occur after menopause. High-impact, power training and oestrogen-containing hormonal replacement therapy (HRT) may reverse these deteriorations. Combined treatments with both training and HRT may have additional effects.

Ethics approval required
Old ethics approval format

Ethics approval(s)
Ethical Committee of the Central Hospital of Central Finland has approved this study on 11th June 1996 (ref: Dnro1053/04/046/06). The study was re-evaluated concerning the use of DNA-samples and approved on the 18th October 2005.

Study design
Randomised double-blind placebo-controlled one-year-trial

Primary study design
Interventional

Study type(s)
Treatment

Health condition(s) or problem(s) studied
Osteopenia, sarcopenia

Interventions
Exercise (Ex): 1-year progressive physical training programme that included a supervised circuit training session twice a week and a series of exercises at home 4 days per week. Training was high-impact power training consisting of circuit training periods for 8 - 11 weeks, interrupted by three high-impact aerobic dance periods for 2 weeks and a summer pause for 5 weeks. They also used placebo tablets.
HRT: the combined oestradiol (2 mg) and noretisterone acetate (1 mg) product (Kliogest®, Novo Nordisk) was administered continously, one tablet per day for one year. The administration of HRT was conducted double-blinded.
Ex+HRT: participants conducted the training program and used HRT.
CO: control arm participants did not recieve any treatment, but they used placebo and were asked not to change their daily physical activities.

Total duration of the treatment was 12 months; the 12-month measurements were performed within a week of ending the treatments. This part of the trial was completed on the 30th August 1997.

A 10-year follow-up measurement was also performed for the participants who were willing to come back to the lab (n = 47). These measurements were performed from the 15th September to 24th November 2007. End of analysis and follow-up will be on the 31st December 2013.

Intervention Type
Drug

Phase
Not Applicable

Drug/device/biological/vaccine name(s)
Oestradiol, noretisterone acetate (Kliogest®)

Primary outcome(s)
1. Developing methods for the testing of material and structural changes in the trabecular and cortical bone sites of the lower leg in relation to high-impact exercise and hormone replacement:
1.1. Single photon absorption method
1.2. Computed tomography
1.3. Elastic wave propagation
1.4. Ultrasonography
2. The effects of a high-intensity, explosive-type physical training and hormonal replacement on lower leg muscle mass, structure and performance in post-menopausal women:
2.1. Ultrasonography
2.2. Computed tomography
2.3. Muscle biopsies
2.4. Maximal isometric strength measurements with dynamometer chair
2.5. Measurement of explosive muscle power; ability to elevate the body's centre of gravity during vertical jumps onto a contact mat
2.6. Muscle performance; maximal running speed over 20 m distance

All measurements were done at baseline (0 months), at mid-point (6 months) and after completion of the treatments (12 months).

Key secondary outcome(s))
1. Examining the molecular mechanism responding to high-intensity, explosive-type physical training and hormonal replacement by using muscle biopsies, taken at baseline, after 0.5 years of study onset and after 1 year of study onset, by microarray and other applicable molecular methods
2. Examining the adaptation of bone collagen metabolism and the different types of muscle fibres to altered force transmission and oestrogen status (using serum and urine samples to determine the content of deoxypyridinoline in overnight (10 hour) samples and using immunohistochemical methods with respective antibodies

All measurements were done at baseline (0 months), at mid-point (6 months) and after completion of the treatments (12 months).

Completion date
31/12/2013

Eligibility

Key inclusion criteria
1. No serious medical conditions
2. No current or previous use of medications including oestrogen, fluoride, calcitonin, biophosphonates or steroids
3. Last menstruation at least 0.5 years but not more than 5 years ago
4. Follicle-stimulating hormone leves greater than 30 iu/litre
5. No contra-indications for exercise and HRT
6. Aged 50 - 57, caucasian post-menopausal women

Participant type(s)
Patient

Healthy volunteers allowed
No

Age group
Adult

Sex
Female

Key exclusion criteria
1. Serious medical conditions
2. Current or previous use of medications including oestrogen, fluoride, calcitonin, biophosphonates or steroids
3. Currently menstruating or having last menstruation within 0.5 years of the onset of study or longer than 5 years ago
4. Follicle-stimulating hormone leves less than 30 iu/litre
5. Contra-indications for exercise and HRT

Date of first enrolment
01/09/1996

Date of final enrolment
31/12/2013

Locations

Countries of recruitment
Finland

Study participating centre
PO Box 35
Jyväskylä
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40014

Sponsor information

Organisation
University of Jyvaskyla (Finland)

ROR
https://ror.org/05n3dz165

Funder(s)

Funder type
Government

Funder Name
Finnish Academy (Finland) - 1st January 1996 - 1st January 2001

Funder Name
Finnish Funding Agency for Technology and Innovation (TEKES) (Finland) - 1st January 1996 - 1st January 2001

Funder Name
Finnish Ministry of Education (Finland) (ref: 98/772/2002)

Results and Publications

Individual participant data (IPD) sharing plan

IPD sharing plan summary
Not provided at time of registration

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Results article	ultrasound and bone mineral density assessment results	01/06/1999		Yes	No
Results article	developing methods for assessing changes in bone results	01/07/2000		Yes	No
Results article	initial results	01/08/2001		Yes	No
Results article	bone mass distribution results	01/07/2002		Yes	No
Results article	developing methods for testing the material changes and turnover in bone results	01/07/2002		Yes	No
Results article	lower-body muscle power results	01/06/2004		Yes	No
Results article	muscle attenuation results	01/09/2005		Yes	No
Results article	muscular transcriptome results	01/12/2007		Yes	No