

The effects of bicycling exercise in people with lower limb lymphedema

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Registration date 09/02/2023	Overall study status Completed	<input type="checkbox"/> Statistical analysis plan <input type="checkbox"/> Results
Last Edited 24/01/2025	Condition category Circulatory System	<input type="checkbox"/> Individual participant data <input checked="" type="checkbox"/> Record updated in last year

Plain English summary of protocol

Background and study aims

Exercise is of main importance in cancer rehabilitation since it has been shown that higher levels of exercise can lower the risk of cancer recurrence and death. Lymphedema (tissue swelling) in the limbs is a well-known side-effect of cancer treatment (secondary lymphedema) but can also be congenital (primary lymphedema). Previously it was assumed that moderate and vigorous exercise may overload the lymphatic system, but nowadays it has been proven that progressive regular exercise is safe and does not worsen the lymphedema. Recently few studies suggested that lymphedema in the lower limb may even improve, in particular when the exercise frequency is high. These studies have some limitations however such as few participants, short duration of exercise or lack of a control group, and therefore more studies are needed. The aim of this study is to evaluate if high-frequency moderate-intensity bicycling exercise is feasible and effective for improving lymphedema status, physical fitness and quality of life in persons with lower limb lymphedema (LLL).

Who can participate?

Patients aged 18 years and over with chronic uni-or bilateral, primary or secondary LLL. The lymphedema should be persistent for at least 6 months with a volume variation of less than 5% for each limb during the last 6 months. No recurrence of the cancer or concurrent diseases or medication affecting the limb/limbs should be present.

What does the study involve?

The participants will be randomly allocated to either the exercise group (bicycling 3 to 5 times a week for 8 weeks), or to the control group (maintaining usual daily routines). For the exercise group the bicycling will be performed on their own using a private bike or an indoor bike provided by the research team. Each exercise session will last for 30 to 60 minutes. A heart rate monitor will be provided to maintain the moderate intensity and a logbook will be used to register each exercise session and any adverse event related to the exercise. Compression stockings will be used daily or day and night according to usual care. If the stockings are older than 2 months at start of the study new ones will be used for 2 weeks before inclusion in the study.

What are the possible benefits and risks of participating?

The benefit of participating is to gain more knowledge about personal lymphedema status. For the exercise group the benefits are possible improvements related to the effects of the exercise. The possible risks for the exercise group are muscle soreness and a small risk of worsening the lymphedema. However, due to regular follow-ups, any adverse event or even a deterioration of the lymphedema will be detected quickly and treated immediately.

Where is the study run from?

Skåne University Hospital (Sweden)

When is the study started and how long is it expected to run for?

February 2016 to December 2022

Who is funding the study?

The Swedish Cancer Foundation (Sweden)

Who is the main contact?

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Contact information

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Additional identifiers

EudraCT/CTIS number

Nil known

IRAS number

ClinicalTrials.gov number

Nil known

Secondary identifying numbers

The Swedish Cancer Foundation 19 0166 Pj01H

Study information

Scientific Title

The feasibility and effects of high-frequency moderate-intensity bicycling exercise in people with lower limb lymphedema: a randomized controlled pilot trial

Study objectives

High-frequency moderate-intensity bicycling exercise is feasible and more effective than regular daily activity, for improving lymphedema status, physical fitness and quality of life in persons with lower limb lymphedema

Ethics approval required

Old ethics approval format

Ethics approval(s)

Approved 16/03/2016, the Swedish Ethical Review Authority (Lund University, Sandgatan 1, Box 133, 22100 Lund, Sweden; +46 (0)10 4750800; registrator@etikprovning.se), ref: Dnr: 2016/136
An amendment to include additional lymphedema clinics in the region was approved in December 2020, ref: Dnr 2020-05960

Study design

Single-center interventional single-blinded randomized controlled trial

Primary study design

Interventional

Secondary study design

Randomised controlled trial

Study setting(s)

Hospital

Study type(s)

Treatment

Participant information sheet

See study outputs table

Health condition(s) or problem(s) studied

Lower limb lymphedema

Interventions

A total of 30 persons with stable lower limb lymphedema, will be randomized to either an exercise group or a control group with an allocation ratio of 2:1. The random allocation sequence will be performed using a computer software program. The exercise group will perform high-

frequency moderate bicycling on their own, on a private bicycle either indoors or outdoors, or on an indoor bike provided by the research team or at a gym (if the participant has access to a gym). The exercise should be performed 3 to 5 times a week for 8 weeks with a mean intensity of 40-59% of the Heart Rate Reserve (HRR). Each session should last 30 to 60 minutes, corresponding to a perceived exertion rate of 12-14 on the Borg's Rating of Perceived Exertion (RPE) Scale. A Polar heart rate monitor will be provided by us and used during all exercise sessions to monitor the heart rate. Before each exercise session there will be some warming-up exercises consisting of bicycling at a self-chosen speed for 5 minutes. After each session there will be a cool-down period consisting of bicycling at a self-chosen pace and stretching. At baseline, the participants in the exercise group will receive written information and verbal instructions about the exercise sessions, the Polar heart rate monitor, Borg's RPE scale, the warming up, cooling down and stretching. A logbook will be used to register; i) the date for each exercise session; ii) the subjective sensation of heaviness and tightness in the lower limbs rated on a Visual Analog Scale, prior to each exercise session and after; iii) the total time for the exercise session in minutes; iv) average heart rate during the exercise session; v) any adverse events related to the performance of the exercise. The logbook will be checked by CJ every 2 weeks during the intervention together with the assessments of LL volume.

The participants randomized to the control group will be encouraged to maintain their usual daily routines during the 8-week period. If they are involved in any form of physical activity or exercise, regular or more spontaneously they will be allowed to continue with such activities.

Intervention Type

Behavioural

Primary outcome measure

1. Lower limb volume, measured as circumferential measurements every 4th cm along the limb at baseline and after 8 weeks. The formula of a truncated cone is used to calculate the total limb volume
2. Local tissue water, measured at 14 different points on the calf and thigh by the MoistureMeterD at baseline and after 8 weeks
3. Arm-to-leg impedance, calculated by measurements of the impedance to extracellular fluid by bioimpedance spectroscopy (BIS) at baseline and after 8 weeks

Secondary outcome measures

1. Cardiovascular fitness measured by a submaximal ergometer test at baseline and after 8 weeks
2. Health-related quality of life measured by the questionnaire Lymphedema Quality of Life Inventory (LyQLI) at baseline and after 8 weeks
3. Impairments, activity limitations and participation restrictions related to the lower limb lymphedema, measured by the questionnaire Lymph-ICF-LL at baseline and after 8 weeks
4. Perception of heaviness and tightness in the lymphedema limb/limbs measured by the Visual Analogue Scale (VAS) at baseline and after 8 weeks
5. Leisure time physical activity during the last 6 months measured by the Saltin-Grimby Physical Activity Level Scale at baseline

Overall study start date

01/02/2016

Completion date

31/12/2022

Eligibility

Key inclusion criteria

1. Aged 18 years or older
2. Uni-or bilateral, primary or secondary lower limb lymphedema
3. Persistent lymphedema for at least 6 months
4. A volume variation of less than 5% for each limb during the last 6 months

Participant type(s)

Patient

Age group

Adult

Lower age limit

18 Years

Sex

Both

Target number of participants

30

Total final enrolment

27

Key exclusion criteria

1. Recurrence of cancer disease
2. Language limitations or dementia
3. Presence of concurrent diseases or medication affecting the limb volume or inability to perform bicycling exercise

Date of first enrolment

21/11/2018

Date of final enrolment

01/11/2022

Locations

Countries of recruitment

Sweden

Study participating centre

Skåne University Hospital

Department of Hematology, Oncology and Radiation Physics

Lymphedema Unit

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Lund
Sweden
22185

Study participating centre
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Fysioterapimottagning
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Rehabiliteringsmottagning
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Sponsor type
University/education

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ROR

Funder(s)

Funder type

Charity

Funder Name

Swedish Cancer Foundation

Alternative Name(s)

Funding Body Type

Private sector organisation

Funding Body Subtype

Trusts, charities, foundations (both public and private)

Location

Sweden

Funder Name

Swedish Association of Chronic Oedema

Results and Publications

Publication and dissemination plan

Planned publication in a high-impact peer-reviewed journal.

Intention to publish date

01/12/2025

Individual participant data (IPD) sharing plan

The datasets generated during and/or analysed during the current study are not expected to be made available. Data will be saved anonymously at Skåne University Hospital in accordance with Swedish ethical rules. Study protocols and participant IDs are stored separately and locked in a file cabinet. Only researchers that are involved in the project will have access to the data.

IPD sharing plan summary

Not expected to be made available

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
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[Participant information sheet](#)

07/11/2022

No

Yes

[Protocol file](#)

07/11/2022

No

No