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Is it feasible to apply a treatment called repetitive occlusive stimulus to reduce muscle wasting in critically ill patients?

Submission date
23/10/2017

Recruitment status
No longer recruiting

Registration date
26/10/2017

Overall study status
Completed

Last Edited
21/11/2023

Condition category
Musculoskeletal Diseases

[X] Prospectively registered

[X] Protocol

[_] Statistical analysis plan

[X] Results

[_] Individual participant data

Plain English summary of protocol

Background and study aims
Hospital intensive care units (ICUs) can be dangerous places. A year after being discharged, 70% of patients remain 'functionally disabled' due to their hospital stays. One reason for this is muscle wasting experienced in hospital. A treatment called Repetitive Occlusion Stimulus (ROS) is a treatment used to try to prevent muscle wasting. A fabric cuff, similar to that used to measure blood pressure, is placed round one thigh and inflated and deflated repeatedly, causing a restriction and then release of blood flow. This has been shown to effectively reduce muscle wasting in patients who are less ill but it has not been tried in ICU patients before. It is uncomfortable but should not cause any distress. Before ROS is tested on a large number of patients it will be tested on a small sample to check for any problems, either in the use of ROS or in the processes of the study. The aim of this study is to see if it is feasible to design a larger trail with the potential to definitively establish if ROS works.

Who can participate?
Adults aged 18 and older who are admitted to the ICU within the past 36 hours.

What does the study involve?
Participants are randomly allocated to one of two groups. Those in the first group receive standard care. Those in the second group receive the standard care as well as two sessions of Repetitive Occlusive stimulus (ROS) treatment for ten successive days. Each session of ROS lasts 35 minutes and involves placing a pressure cuff, similar to one used to measure the blood pressure, around the patient’s right thigh which is then inflated and deflated over 5 minute intervals, four times to cause restriction and then release of blood flow. The outcome measures which include ultrasound assessment of cross sectional area of rectus femoris muscle, ultrasound assessment of vessels function (resting vessel diameter & blood flow, flow mediated dilation and reactive hyperaemic response) as well as assessment to test the physical function and muscle strength are carried out at baseline (day 1), day 6 &11 of ICU stay, ICU & hospital discharge. After 3 months of hospital discharge, a telephone follow up is carried out.

What are the possible benefits and risks of participating?
Benefits of taking part in the study include close monitoring by the research team such as ultrasound scan for blood clots. Furthermore, there is potential that participant that receives ROS treatment will experience reduced muscle wasting and improved vascular function. For all patients taking part in the study, there is a minor risk (bruising, inflammation or fainting) associated with one episodes of phlebotomy at hospital discharge. To mitigate this risk only suitably qualified and experience staff will be take the blood sample. The pressure used to inflate the cuff for repetitive occlusive stimulus and to measure vascular outcome measure might be uncomfortable. In the unlikely event participant experience unbearable discomfort then pain-killers will be given and the pressures reduced or session stopped immediately. Minor skin irritation/discolouration may occur such as petechias (red spots on the skin caused by burst capillary vessels) and bruising around the pressure cuff. To reduce the risk wider pressure cuff are being used in this study and in addition daily physical examination of leg for any sign of injury will be performed by the research nurse. Also there is a small risk of serious side effects of repetitive occlusive stimulus including severe muscle damage (rhabdomyolysis), a blood clot in the vein (venous thrombus) and/or lungs (pulmonary embolism). These risks are very low. To mitigate these risks, participants are closely monitored. The level of marker for muscle damage (creatinine kinase) are assessed daily, ultrasound scan to assess for blood clot are carried out daily before the first ROS session in treatment group, while on day 1, 6, and 11 in control group.

Where is the study run from?
1. Royal Surrey County Hospital (UK)
2. St Peter's Hospital (UK)

When is the study starting and how long is it expected to run for?
July 2015 to May 2019

Who is funding the study?
Intensive Care Foundation and NIHR Research for Patient Benefit (UK)

Who is the main contact?
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Contact information

Type(s)
Public

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Additional identifiers

Clinical Trials Information System (CTIS)
Nil known

ClinicalTrials.gov (NCT)
Nil known

Protocol serial number
34935

Study information

Scientific Title
Preventing muscle wasting in critically ill patients by repetitive occlusive stimulus (ROS): a feasibility study

Acronym
ROSProx

Study objectives
The aim of this study is to determine if it is safe, tolerable and feasible to apply treatment called Repetitive Occlusion Stimulus (ROS) as well explore its effectiveness of preventing muscle wasting on a small group of ICU patients and use these results to design a larger trial in the future.

Ethics approval required
Old ethics approval format

Ethics approval(s)
London Queen Square Research Ethic Committee, 08/09/2017, ref: 17/LO/0934

Study design
Randomised; Interventional; Design type: Treatment, Physical, Rehabilitation

Primary study design
Interventional

Study type(s)
Treatment

Health condition(s) or problem(s) studied
Specialty: Critical care, Primary sub-specialty: Critical Care; UKCRC code/ Disease: Generic Health Relevance/ No specific disease

Interventions
Participants recruited to the study are randomised to either treatment group or control group.

Participants in control group receive standard care, while Participants in treatment group receive a treatment called Repetitive Occlusive stimulus (ROS) in addition to standard care. ROS involves placing a pressure cuff, similar to one used to measure the blood pressure, around the patient's right thigh which is then inflated and deflated repeatedly to cause restriction and then release of blood flow.

Patients in treatment group receive two sessions of ROS from Day 1 to 10 (20 sessions in total) in morning and late afternoon (at least 4 hours apart). Each session of ROS lasts 35 minutes and involves 4 cycles of 5 minutes of inflation and 5 minutes deflation of cuff.

In addition, following assessment are carried to monitor the changes in muscle and blood vessel:

1. On three occasions (days 1, 6 and 11 of ICU stay), ultrasound assessment of muscle and blood vessels is carried out. In addition patients in treatment group receive additional ultrasound scan for blood clots on day 2 to 10 of ICU stay before the first ROS session
2. One urine sample (day 1 of ICU) and four blood samples (day 1, 6 and 11 of ICU, and hospital discharge). Urine is collected from a catheter drainage bag and wherever possible, blood is taken from a cannula (already in place in ICU patients) or via direct venepuncture (at hospital discharge).
3. On four occasions (day 6 and 11 of ICU, and at ICU and hospital discharge) strength of handgrip and other muscle groups using the Medical Research Council (MRC) strength score is assessed
4. On day 1, 6 and 11 of ICU, and at ICU discharge mobility using the ICU Mobility Scale (IMS) are observed, while at hospital discharge in addition physical function assessment 'Sit to Stand test' and 'Get up and Go test' are carried out
5. At hospital discharge, participant and personal consultee undergo semi-structured interview to assess the acceptability of the trial, and then 3 months after discharge a telephone follow-up are carried out to ask about the health and recovery

Intervention Type
Other

Primary outcome(s)
The incidence of severe adverse events per participant in the control and treatment group are monitored from the time a personal consultee gives consent for the patient to participate in the study up to 3 months follow-up contact.

Key secondary outcome(s))
1. Tolerability is measured using pain on visual analog scale (VAS) at each ROS session
2.Feasibility to apply to ICU patients following is assessed using the success rate of screening potential eligible patients, Success rate of obtaining consent and recruiting patients, success rate of delivering ROS session as intended, success rate of performing outcome measure assessment as intended
3. Acceptability for patient, personal consultee and clinical staff is assessed using semi-structured interview at hospital discharge (patients and personal consultee) and at the end of study (clinical staff)
4. Difference in muscle function between control group and treatment group following will be assessed using:

4.1. Cross sectional area of rectus femoris muscle in right leg (control group) and both legs (treatment group) at day 1, 6 and 11 of ICU stay
4.2. Hand grip strength and other muscle group strength using MRC-Sum Score at day 6, 11 of ICU stay (or first day awakening) as well as at ICU and hospital discharge
4.3. Physical function assessment: ICU mobility scale (at day 1, 6, and 11 of ICU stay & ICU and hospital discharge), Sit to Stand & timed up and go (at hospital discharge only)
5. Difference in vascular function between control group and treatment group, reactive hyperaemic response and flow mediated dilatation of superficial femoral artery will be carried out on day 1, 6, 11 of ICU stay

Completion date
31/07/2019

Eligibility

Key inclusion criteria
1. Age ≥ 18 years, both male & female
2. Admitted to the ICU within the past 36 hours
3. Personal consultee provides declaration of agreement for patient enrolment, retrospective patient consent
4. Invasive mechanical ventilation
5. At least 2 other organ failures as defined by scoring ≥1 points on two of the SOFA score domains
6. Likely to remain on ICU for at least 4 days as classified by attending consultant

Participant type(s)
Patient

Healthy volunteers allowed
No

Age group
Adult

Lower age limit
18 years

Sex
All

Total final enrolment
12

Key exclusion criteria
1. Profound cardiovascular instability – infused vasopressors > = 0.5mcg/kg/min of norepinephrine; or in opinion of senior attending doctor
2. Profound coagulopathy (Prothrombin time> 2.5x normal or platelet count of < 80) or bleeding diathesis
3. Neuromuscular condition – any previous or concurrent neurological condition or muscle disease

4. History of peripheral arterial vascular disease – any previous surgery or interventional procedure for peripheral arterial insufficiency, or any reason to clinically suspect arterial insufficiency of the leg – such as collateral history of claudication or examination findings of absent peripheral pulses
5. Prior amputation of a lower limb
6. Obesity (BMI> 40); due to technical considerations.
7. Unlikely to survive ICU
8. Disseminated malignancy
9. Pregnancy
10. Previous, or current, DVT and PE
11. Positioned prone
12. Contraindication to pharmacological venous thromboembolism prophylaxis
13. Pre-existing significant cognitive impairment
14. Enrolled in a conflicting interventional trial
15. Lack ability to communicate in verbal and written English

Date of first enrolment
30/10/2017

Date of final enrolment
12/03/2019

Locations

Countries of recruitment
United Kingdom

England

Study participating centre
Royal Surrey County Hospital
Egerton Road
Surrey
Guildford
United Kingdom
GU2 7XX

Study participating centre
St Peter's Hospital
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Sponsor information

Organisation
Royal Surrey County Hospital NHS Foundation Trust

ROR
https://ror.org/050bd8661

Funder(s)

Funder type
Charity

Funder Name
Intensive Care Society

Alternative Name(s)
The Intensive Care Society, ICS

Funding Body Type
Private sector organisation

Funding Body Subtype
Trusts, charities, foundations (both public and private)

Location
United Kingdom

Results and Publications

Individual participant data (IPD) sharing plan
The datasets generated and/or analysed during the current study during this study will be included in the subsequent results publication.

IPD sharing plan summary
Other

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Results article		06/07/2022	21/11/2023	Yes	No
Protocol article	protocol	24/07/2019	26/07/2019	Yes	No
HRA research summary			28/06/2023	No	No

Participant information sheet	Participant information sheet	11/11/2025	11/11/2025	No	Yes