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Effect of high flow oxygen on exercise capacity in patients with interstitial lung diseases during an exercise test on a bicycle compared with the effect obtained using low flow oxygen

Submission date
17/05/2021

Recruitment status
No longer recruiting

Registration date
21/05/2021

Overall study status
Completed

Last Edited
03/03/2025

Condition category
Respiratory

[X] Prospectively registered
[X] Protocol
[_] Statistical analysis plan
[X] Results
[_] Individual participant data

Plain English summary of protocol

Background and study aims
Interstitial lung disease (ILD) is a diverse group of illnesses that cause damage to the lungs through varying degrees of inflammation. One of the main problems of this disease is the drop in the levels of oxygen in the blood on the exercise, which leads to functional limitation and alteration of the quality of life of these patients. Oxygen supplementation during exercise might allow physical training at a higher level. The purpose of this test is to evaluate the maximal capacity of the lungs and heart during the exercise.

Who can participate?
All patients affected with interstitial lung diseases referred to the physiotherapy department to receive pulmonary rehabilitation in the Lothian region between 18 and 80 years old and with the ability to give informed consent will be able to participate.

What does the study involve?
The study will run for only 2 days. During the first day height, weight, spirometry, and an exercise test will be taken. Spirometry is a test that will measure the lung function of the participants. They will be examined by this simple breathing test, where participants will be seated and given up to 4 puffs (up to 400 micrograms) of salbutamol inhaler. After about 15 minutes, participants will be asked to blow hard and fast into a tube for as long as they can. It is the same procedure as the one they have done in outpatient clinic. Moreover, during the first day, participants will be asked to carry out a maximal exercise test on a bicycle called Cardiopulmonary Exercise Test (CPET). We will get participants on the bicycle first, they will have to just breathing for 1 minute before we start them exercising and then there will be a warm up period of 3 minutes easy pedalling before we start increasing the workload as though participants were going up a hill. We want participants to really push themselves and do as much as possible. The workload progressively increases, and the test is completed when participants are too breathless to continue. The purpose of this test is to measure how much time their lungs and heart are able to do exercise.

During the second day, participants will undergo two exercise tests on a bicycle, but this time the workload will be constant, (75% of the maximal work load obtained from the maximal exercise test conducted the day before) separated by 60 minutes. Patients will receive randomly oxygen delivered via nasal cannula or HFNO using sealed letters, according to this some participants will first receive oxygen through HFNO and then through a nasal cannula and vice versa.

What are the possible benefits and risks of participating?
The information gained from the participation of the patients may enable us to come up with the most optimal rehabilitation programme in the future, and this may benefit patients with ILD. Their results from the assessments we perform will also be made available to them and their general practitioner with their consent. We will inform them and their GP if anything with clinical relevance is found.
During a CPET participants might experience the following: breathlessness or leg fatigue. They can stop the test at any time. Other more unfrequent symptoms may develop during exercise such as chest pain, drop in blood oxygen levels, drop or increment in their blood pressure. We will be monitoring these and we may decide to stop the test if we feel this is a risk. A clinician will be available to deal with any problem.

Where is the study run from?
Department of Physiotherapy of the Royal Infirmary of Edinburgh (UK)

When is the study starting and how long is it expected to run for?
February 2021 to October 2023

Who is funding the study?
Chilean National Scholarship Program for Graduate Studies

Who is the main contact?
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Contact information

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Public

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Additional identifiers

Clinical Trials Information System (CTIS)
Nil known

Integrated Research Application System (IRAS)
299088

ClinicalTrials.gov (NCT)
Nil known

Protocol serial number
IRAS 299088, AC21047

Study information

Scientific Title
Effect of HFNO on exercise tolerance in patients with interstitial lung diseases during a constant work rate cycle test compared with the effect obtained using oxygen through nasal cannula

Study objectives
High Flow Nasal Oxygen (HFNO) increases exercise tolerance in patients with Interstitial Lung Diseases (ILD) in a lab setting assessed as exercise endurance (Tlim) during a Constant Work Rate Exercise Test (CWRET)

Ethics approval required
Old ethics approval format

Ethics approval(s)
Approved 29/11/2021, South East Scotland REC 02 (2nd Floor, Waverley Gate, 2-4 Waterloo Place, Edinburgh, EH1 3EG, UK; +44 (0)131 536 9000; sandra.wyllie@nhslothian.scot.nhs.uk), ref: 21/SS/0046

Study design
Single-centre randomized controlled cross-sectional study

Primary study design
Interventional

Study type(s)
Treatment

Health condition(s) or problem(s) studied
Exercise tolerance in patients with interstitial lung diseases

Interventions
RECRUITMENT, CONSENT AND SCREENING: all Patients affected with interstitial lung diseases referred to the physiotherapy department to receive pulmonary rehabilitation in the Lothian region will be invited by a member of the direct care team to participate and will receive a patient's information sheet with an invitation to attend pre-assessment for this study. Patients will be given more than 24 hours to consider participation in the study, signing the informed consent. At pre-assessment, the study will be explained to them and written informed consent will be obtained from those agreeing to participate.

RANDOMISATION: following confirmation of eligibility by the CI or PI and signature of the informed consent, patients will be randomised using sealed letters to HFNO or nasal cannula. Patients will be sequentially randomised. Randomisation code and sealing of envelopes will be done by the research nurse and stored in a room at Royal Infirmary of Edinburgh (RIE) accessible with a key.

BLINDING: in this open label study patients will not be blinded in respect to the modality of oxygen delivery but will not know the dose of oxygen they will be receiving or their SpO2 during the tests.

INTERVENTION: the intervention consists of supplemental oxygen delivered via HFNO at 37°C. Patients that find too warm this temperature can receive HFNO at 34°C. HFNO has a humidifier that saturates the gas mixture at temperature of 31 to 37 C. To minimize condensation, the heated humidified gas is delivered via heated tubings through a wide-bore nasal prong. Air flow will be 50 L/min and FiO2 will be titrated to maintain SpO2 above 88%. The comparator will be oxygen delivered via nasal cannula titrated to the same SpO2. Both Constant Work Rate Exercise Tests (CWRET) will be performed at the same work load (75% of the maximal watts achieved beforehand during a Cardiopulmonary Exercise Test (CPET).

DURATION OF THE STUDY: patients will attend 2 days. On the first day anthropometric and lung function data will be obtained and CPET in a cycle-ergometer will be performed.

On the second day, patients will perform two constant work rate cycle tests at 75% of the maximal work load obtained from a CPET separated by 60 minutes. Patients will receive randomly oxygen delivered via nasal cannula or HFNO. During all these tests, heart rate, oxygen levels in the blood and blood pressure will be monitored.

Intervention Type
Supplement

Primary outcome(s)
Exercise capacity assessed as endurance time (Tlim) during a constant work rate cycle test at 75% of the maximal work load (obtained beforehand from a CPET) at a single time point

Key secondary outcome(s))

1. SpO2 measured using a pulse oximeter throughout the CPET performed the first day and during the 2 CWRET performed during the second day
2. Heart rate (bpm) measured using a pulse oximeter throughout the CPET performed the first day and during the 2 CWRET performed during the second day
3. Dyspnoea and leg fatigue measured using the Borg scale at before and after of each test

Completion date
30/12/2023

Eligibility

Key inclusion criteria
1. Fibrosing lung disease on HRCT obtained from medical records, defined as reticular abnormality with traction bronchiectasis with or without honeycombing, with disease extent of >10%, performed within 24 months of screening visit Clinical stability concerning pulmonary infections or acute exacerbations within the previous four weeks of inclusion in the study
2. Absence of recent Myocardial Infarction (within last 3 months), unstable angina, other significant cardiac problems, systolic blood pressure >180 mmHg, diastolic blood pressure >100 mmHg or tachycardia (higher than 100 bpm)
3. Absence of significant orthopaedic, neurological, cognitive and/or psychiatric impairment restricting mobility
4. Not following any exercise programme in the last 3 months
5. Participants between 18 and 80 years old will be recruited and with the ability to give informed consent

Participant type(s)
Patient

Healthy volunteers allowed
No

Age group
Adult

Lower age limit
18 years

Upper age limit
80 years

Sex
All

Total final enrolment
18

Key exclusion criteria
1. Emphysema greater than extent of fibrosis on high resolution computed tomography (HRCT) of the thorax
2. FEV1/FVC ratio < 70%

3. Involvement in the planning and/or conduct of the study
4. Participants should not be taking part in other interventional studies
5. Patient is unable to attend the assessment sessions or would like to withdraw from the study
6. Absolute contraindications for cardiopulmonary exercise testing, which are:
6.1. Unstable angina
6.2. Uncontrolled arrhythmias causing symptoms or hemodynamic compromise
6.3. Syncope
6.4. Active endocarditis.
6.5. Acute myocarditis or pericarditis
6.6. Symptomatic severe aortic stenosis
6.7. Uncontrolled heart failure
6.8. Acute pulmonary embolus or pulmonary infarction
6.9. Thrombosis of lower extremities
6.10. Suspected dissecting aneurysm
6.11. Uncontrolled asthma
6.12. Pulmonary edema
6.13. Room air desaturation at rest ≤85%
6.14. Respiratory failure
6.15. Acute noncardiopulmonary disorder that may affect exercise performance or be aggravated by exercise (i.e. infection, renal failure, thyrotoxicosis)
6.16. Mental impairment leading to inability to cooperate

Date of first enrolment
16/05/2022

Date of final enrolment
08/11/2023

Locations

Countries of recruitment
United Kingdom

Scotland

Study participating centre
Royal Infirmary of Edinburgh
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Sponsor information

Organisation

University of Edinburgh

ROR
https://ror.org/01nrxwf90

Funder(s)

Funder type
Government

Funder Name
Chilean National Scholarship Program for Graduate Studies (ANID)

Results and Publications

Individual participant data (IPD) sharing plan
The datasets generated during and/or analysed during the current study will be stored in a non-publically available repository.

DATA MANAGEMENT AND ANALYSIS
Data will be entered in an Excel datasheet and imported to the statistical package SPSS version 23 for analysis. The anonymised database will be held on a university computer.

PERSONAL DATA
The following personal data will be collected as part of the research: Name, CHI number, study-related unique identifier number, gender, and age. The data will be collected on paper and held in The Royal Infirmary of Edinburgh in a locked room. The study data will be entered in an anonymised database where patients will be with the study-related unique identifier number held in a university computer at CIR. Personal data will be stored for 3 years.

DATA INFORMATION FLOW
Personal data will be collected for approximately 6 months and these will be used for 6 more months and will be deleted 3 years after finishing the study.

TRANSFER OF DATA
Data collected or generated by the study (including personal data) will not be transferred to any external individuals or organisations outside of the Sponsoring organisation(s).

DATA CONTROLLER
A data controller is an organisation that determines the purposes for which, and the manner in which, any personal data are processed. The University of Edinburgh and NHS Lothian are joint data controllers along with any other entities involved in delivering the study that may be a data controller in accordance with applicable laws (e.g. the site)

DATA BREACHES
Any data breaches will be reported to the University of Edinburgh and NHS Lothian Data

Protection Officers who will onward report to the relevant authority according to the appropriate timelines if required.

IPD sharing plan summary

Stored in non-publicly available repository

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Basic results		03/03/2025	03/03/2025	No	No
Participant information sheet	version v1.0	28/04/2021	01/06/2021	No	Yes
Participant information sheet	Participant information sheet	11/11/2025	11/11/2025	No	Yes
Protocol file	version v1.0	28/04/2021	01/06/2021	No	No