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A pilot study of lung ultrasound as point of care evaluation in post-COVID-19 patients

Submission date
18/12/2020

Recruitment status
No longer recruiting

Registration date
06/01/2021

Overall study status
Completed

Last Edited
03/03/2023

Condition category
Infections and Infestations

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

Plain English summary of protocol

Current plain English summary as of 03/03/2021:

Background and study aims:
The coronavirus (also known as SARS-CoV-2) has caused millions of infections worldwide since it was first reported in December 2019. Some people who have been infected by the virus will get serious breathing difficulties during their infection, some of whom may need oxygen and machines to help them breathe. Many patients who have recovered from this illness (also known as COVID-19) may continue to be unwell with severe tiredness and breathlessness well after the virus has been cleared by their immune system. This can lead to life-long complications such as lung scarring (also known as lung fibrosis).
Whilst CT scans are very good at finding the changes associated with lung fibrosis in COVID-19, they are not always available, use much more radiation than a chest X-ray and need an injection of contrast into a vein. Furthermore high-resolution CT of the chest is currently used for research purposes only in studies of COVID-19. Lung Ultrasound has recently been shown to be better than Chest X-ray in finding some of the changes seen in lung fibrosis. Lung Ultrasound does not use ionising radiation, which means that patients can have it many times without exposure to ionising radiation. Ultrasound is also portable so it can be easily performed in the Outpatients Department.
With this research, the researchers want to see if Lung Ultrasound is as good as a CT scan at finding inflammation in the lungs of patients who have recently recovered from COVID-19. By showing that Lung Ultrasound can replace lung CT scans, we expect to reduce the number of clinic visits patients have to make to see their hospital specialist, as well as reduce the extent of ionising radiation exposure.

Who can participate?
Patients who have recently been hospitalised for COVID-19 and who required oxygen during their inpatient stay will be invited to participate in this study before their discharge from hospital. Participants will be adults aged 18 - 80 who can provide consent and can walk up to 100 metres without assistance. Unfortunately those with visual or hearing impairment, are pregnant or those who cannot engage in consent are not suitable for this study.

What does the study involve?
Participants will be asked to provide a blood sample on Day 1 (day of hospital discharge) as well as undergo a lung ultrasound. The lung ultrasound procedure should not take more than 20 minutes and involves applying an ultrasound probe to the skin of the chest wall using a small amount of lubricating gel to obtain images of the lung, which will be subsequently analysed. The procedure is completely painless.
On Day 42 (Week 6) of the study, participants will be invited to complete a short questionnaire regarding their health status and extent of recovery from the illness along with another lung ultrasound. A breathing test to measure lung function (spirometry with gas transfer) and a further blood sample will be taken at this time.
On Day 84 (Week 12) of the study , participants will be invited to provide a further blood sample, repeat the breathing test (spirometry with gas transfer) and undertake a 6-minute walk test. The lung ultrasound procedure will be repeated, and the health status questionnaire as well as a feedback survey will be completed at this time.
Finally participants will be invited to undergo a CT scan of the chest. This scan will allow the investigators the compare the findings of the lung ultrasound with the CT scan in order to understand how sensitive lung ultrasound is in detecting the changes associated with pulmonary fibrosis due to COVID-19 infection.

What are the possible benefits and risks of participating?
Participants will not gain any direct benefit from the findings of the research. However, their participation will provide vital information about how useful lung ultrasound can be in the monitoring of patients with post-COVID syndrome, and help define new ways of imaging the lungs to detect lung damage from this illness.
Beyond the three visits to the hospital, and potential discomfort from undergoing the blood tests, participants re unlikely to experience any additional risks to themselves. They will be notified of any unexpected findings from the chest CT scan performed at the end of the study; this will also be communicated to their General Practitioners.

Where is the study run from?
Maidstone and Tunbridge Wells NHS Trust (UK)

When is the study starting and how long is it expected to run for?
September 2020 to March 2022

Who is funding the study?
Maidstone & Tunbridge Wells NHS Trust (UK)

Who is the main contact?
Dr Tuck-Kay Loke
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Previous plain English summary:

Background and study aims
The current pandemic caused by the 2019 novel coronavirus (also known as SARS-COV-2) is currently the subject of intense research activity. This new infection (COVID-19) affects people of all ages, and a significant proportion of those infected (10-15%) may require hospitalisation and ventilator support. Some of these patients will develop lung scarring (also known as pulmonary fibrosis) following recovery from their illness although the exact numbers of those who could be affected remain unclear. Lung ultrasound has recently been shown to help detect the early changes of COVID-19 pneumonia and can be useful in deciding which patients are likely

to require more intensive care than supplemental oxygen during their hospital stay.
The aim of this study is to evaluate how lung ultrasound can be used to monitor patients who have recently recovered from COVID-19. It is hoped that by carefully evaluating a selected group of individuals using this technique the researchers will be able to gain a better understanding of which patients may end up with pulmonary fibrosis and whether current blood markers may help to predict a poorer outcome.

Who can participate?
Patients who have recently been hospitalised for COVID-19 and who required oxygen during their inpatient stay will be invited to participate in this study before their discharge from hospital. Participants will be adults aged 18 - 80 who can provide consent and can walk up to 100 metres without assistance. Unfortunately those with visual or hearing impairment or those who cannot engage in consent are not suitable for this study.

What does the study involve?
Participants will be asked to provide a blood sample on Day 1 (day of hospital discharge) as well as undergo a lung ultrasound. The lung ultrasound procedure should not take more than 20 minutes and involves applying an ultrasound probe to the skin of the chest wall using a small amount of lubricating gel to obtain images of the lung, which will be subsequently analysed. The procedure is completely painless.
On Day 42 (Week 6) of the study, participants will be contacted by telephone to complete a questionnaire regarding their health status and extent of recovery from the illness. A further blood sample will be taken at this time and an appointment made for each participant to attend an outpatient clinic review on Day 84 (Week 12). At this visit, each participant will be asked to provide a further blood sample, perform a breathing test (known as spirometry) and undertake a 6-minute walk test. The lung ultrasound procedure will be repeated and a feedback survey completed at the end of the outpatient review.
Finally participants will be invited at the end of the study to undergo a CT scan of the chest as a separate appointment. This scan will allow the investigators the compare the findings of the lung ultrasound with the CT scan in order to understand how sensitive lung ultrasound is in detecting the changes associated with pulmonary fibrosis due to COVID-19 infection.

What are the possible benefits and risks of participating?
Participants will not gain any direct benefit from the findings of the research. However, their participation will provide vital information about how useful lung ultrasound can be in the monitoring of patients with post-COVID syndrome, and help define new ways of imaging the lungs to detect lung damage from this illness.
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Dr Tuck-Kay Loke
tuckkay.loke@nhs.net

Contact information

Type(s)
Scientific

Contact name
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Additional identifiers

Integrated Research Application System (IRAS)
114855

Study information

Scientific Title
The evaluation of lung ultrasound as a new diagnostic tool for the assessment of patients following acute coronavirus (COVID-19) infection requiring hospitalisation

Acronym
COVIDLUS

Study objectives
Lung ultrasound (LUS) can be used as a non-invasive test for the detection of post-COVID lung fibrosis and interstitial changes. The extent of LUS features at 12 weeks post hospitalisation in patients with persistent symptoms correlates with lung function impairment and functional disability in these patients

Ethics approval required
Old ethics approval format

Ethics approval(s)

Approved 02/03/2021, Cambridge East REC (Health Research Authority, HRA Nottingham, The Old Chapel, Royal Standard Place, Nottingham, NG1 6FS, UK; +44 (0)20 7104 8096; cambridgeeast.rec@hra.nhs.uk), REC ref:

Primary study design
Observational

Study design
Observational prospective study

Study type(s)
Diagnostic

Health condition(s) or problem(s) studied
Post COVID-19 (SARS-CoV-2 infection) imaging surveillance

Interventions
Current interventions as of 03/03/2021:
Lung Ultrasound (LUS) will be used to measure the improvement in subpleural interstitial changes related to COVID-19 infection in subjects following their discharge from hospital. The LUS findings will be compared with CT Thorax as the reference standard at Day 84 of the study.

Previous interventions:
The researchers will measure the presence of subpleural interstitial changes by LUS at week 12 post hospital discharge and correlate these with interstitial abnormalities detected on CT thorax at this timepoint.

Intervention Type
Device

Phase
Not Applicable

Primary outcome(s)
Current primary outcome measure as of 03/03/2021:
1. The overall diagnostic accuracy of LUS as a test to identify pulmonary fibrosis as compared to CT thorax in post-COVID patients, assessed by calculating the sensitivity, specificity, positive predictive value, negative predictive values of LUS at Day 84
2. The utility of Lung Ultrasound (LUS) to sequentially monitor interstitial changes in the lungs of 20 patients who have recently recovered from COVID-19 pneumonia, assessed using a validated LUS scoring system at Days 1, Day 42 and Day 84

Previous primary outcome measure::
Lung fibrosis and interstitial changes measured using lung ultrasound (LUS) at Day 1 and Day 84

Key secondary outcome(s)
Current secondary outcome measures as of 03/03/2021:
The extent to which LUS provides additional predictive and prognostic information in assessing the rate of recovery of patients recently hospitalized with COVID-19. LUS scores at days 1, 42 and 84 will be correlated with:
1. Serum biomarkers (C-reactive protein, D dimers, lactate dehydrogenase, ferritin, full blood

count, troponin) measured on Days 1, 42 and 84
2. Lung function measured using spirometry with gas transfer (FEV1 and FVC) at Days 42 and 84
3. Functional capacity measured with 6MWT at Day 84
4. Quality of life measured using EQ-5D as a surrogate measure of 'wellness' at days 42 and 84
5. SaO2% measured using pulse oximetry at Days 1-84

Previous secondary outcome measures:
1. Lung fibrosis and interstitial changes measured using CT scan at Day 84
2. Lung function measured using spirometry at Day 84

Completion date
18/03/2022

Eligibility

Key inclusion criteria
1. Aged 18-80 years
2. Positive sample for SARS-CoV-2 (detected by RT-PCR from a nasopharyngeal swab)
3. Admitted to hospital due to/with COVID-19

Added 03/03/2021:
4. Lung infiltrates on chest X-ray

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
21

Key exclusion criteria
At baseline:
1. Unable to mobilise independently
2. Visually or cognitively impaired
3. Unable to provide informed consent

Added 08/01/2021:
4. Pregnancy

Added 03/03/2021:
5. Allergy to CT contrast

Date of first enrolment
03/03/2021

Date of final enrolment
03/03/2022

Locations

Countries of recruitment
United Kingdom

England

Study participating centre
Tunbridge Wells Hospital
Maidstone and Tunbridge Wells NHS Trust
Tonbridge Road
Tunbridge Wells
United Kingdom
TN2 4QJ

Sponsor information

Organisation
Maidstone and Tunbridge Wells NHS Trust

Funder(s)

Funder type
Charity

Funder Name
Maidstone & Tunbridge Wells NHS Research Charity

Results and Publications

Individual participant data (IPD) sharing plan

The data-sharing plans for the current study are unknown and will be made available at a later date.

IPD sharing plan summary

Data sharing statement to be made available at a later date

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Results article		03/03/2023	03/03/2023	Yes	No
Poster results			12/12/2022	No	No