

# MRI to optimise lung cancer radiotherapy

<b>Submission date</b> 07/12/2023	<b>Recruitment status</b> No longer recruiting	<input type="checkbox"/> Prospectively registered <input type="checkbox"/> Protocol
<b>Registration date</b> 18/12/2023	<b>Overall study status</b> Completed	<input type="checkbox"/> Statistical analysis plan <input type="checkbox"/> Results
<b>Last Edited</b> 09/01/2024	<b>Condition category</b> Cancer	<input type="checkbox"/> Individual participant data <input type="checkbox"/> Record updated in last year

## Plain English summary of protocol

### Background and study aims

Radiotherapy treatment of lung cancer aims to destroy tumour and prevent recurrence, whilst limiting radiation exposure to non-tumour regions. Many lung cancer patients have other lung diseases that result in heterogeneous function, and lung function can worsen in some people after radiotherapy as the treatment damages the few remaining lung regions with good function. The study team have developed 3D MRI scan measurements of lung function. This study aims to test their ability to report on lung functional heterogeneity in lung cancer patients and to test the ability to use this functional information to produce better radiotherapy treatment strategies that limit radiation impact on post-treatment lung function.

### Who can participate?

Adults over 18 years old, with non-small cell lung cancer and planned to receive radical OR high dose palliative radiotherapy (+/- adjuvant chemotherapy or surgery).

### What does the study involve?

The study team are a group of researchers examining the feasibility of measuring lung function using Magnetic Resonance Imaging (MRI scanning) to develop new ways of planning radiotherapy treatment for lung cancer. The research uses a special tracer gas that can be seen on MRI scans and can be safely inhaled during MRI scanning. The MRI scans give pictures of this tracer gas in the lungs and show any regions of the lungs that are not working well (i.e. are poorly ventilated). MRI scanning is used because it is a safe medical imaging method that can be performed without risking harm to the patient. There are other medical imaging techniques used to assess lung function, like CT scanning and gamma camera methods. However, these other methods use X-rays or radioactivity to produce images of lung function, which can harm patients. The motivation for this work is to develop lung imaging techniques that do not involve radioactivity or X-rays. In this study, the team are assessing if it is possible to use our MRI scan methods to detect parts of the lung that are poorly ventilated in patients with lung cancer who are planning to receive radiotherapy and test how well our scans can characterise differences in function in different areas of the lung.

### What are the possible benefits and risks of participating?

This study will not benefit patients directly, but the information that is obtained may help in the

development of new non-invasive methods to study lung function and detect differences in lung function within the lungs of patients with lung cancer requiring radiotherapy. It is anticipated that this will be of benefit in the future to patients who are having radiotherapy.

Where is the study run from?

Newcastle upon Tyne Hospitals NHS Foundation Trust (UK)

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

October 2023 to September 2024

Who is funding the study?

Medical Research Council (UK)

Who is the main contact?

Nuth.ProjectManagement@nhs.net

## Contact information

### Type(s)

Scientific, Principal investigator

### Contact name

Dr Rachel Pearson

### ORCID ID

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### Contact details

Consultant Clinical Oncologist

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rachel.pearson1@nhs.net

### Type(s)

Public

### Contact name

Dr Research Activity Co-ordinator and Study Co-ordinator

### Contact details

Project Management mailbox

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United Kingdom

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None provided

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## Additional identifiers

### Clinical Trials Information System (CTIS)

Nil known

### Integrated Research Application System (IRAS)

330496

### ClinicalTrials.gov (NCT)

Nil known

### Protocol serial number

CPMS 58734, MR/X50290X/1, IRAS 330496

## Study information

### Scientific Title

Using lung ventilation imaging to optimise lung cancer radiotherapy plans

### Study objectives

The purpose of this pilot study is to provide initial data on regional differences in lung ventilation properties in patients receiving radiotherapy for lung cancer treatment and to compare this data to radiotherapy planning CT scans. The study is not statistically powered, no formal hypothesis testing is performed, and we have no prior data in these patient groups to inform power calculations. It is anticipated that study findings will inform power calculations in the design of downstream studies using our novel MRI methods in radiotherapy planning for patients with lung cancer.

### Ethics approval required

Ethics approval required

### Ethics approval(s)

approved 07/11/2023, London – City & East Research Ethics Committee (2 Redman Place, Stratford, London, E20 1JQ, United Kingdom; +44 (0)207 1048171, (0)207 1048134, (0)207 104 8124; cityandeast.rec@hra.nhs.uk), ref: 23/PR/1087

### Study design

Interventional non-randomized

### Primary study design

Interventional

### Study type(s)

Diagnostic, Treatment

### Health condition(s) or problem(s) studied

Lung cancer

### Interventions

Patients who meet the study inclusion criteria who attend outpatient cancer care clinics at Newcastle upon Tyne Hospitals NHS Foundation Trust will be identified by members of the study team. They will then be approached in person or contacted by phone, letter or email by a member of the study team to determine whether they wish to participate. They will be provided with the Participant Information Sheet and will be asked questions relating to medical history and medications by a medically qualified member of the study team. This will be performed specifically to determine that inclusion criteria are met and to screen for exclusion criteria. Participants will be invited to attend a study visit on a day convenient to them at the Newcastle Magnetic Resonance Centre.

Written informed consent will be obtained by a member of the study team after the potential participant has been allowed to read the PIS and at least 24 hours to consider participation in the study.

They will be invited to discuss any aspect of the study with the study team before giving consent. Persons who are unable to give informed consent for themselves will not be recruited to the study. Participants will be contacted by telephone to ensure they are well on the morning of or the day before the scan. Informed consent will be given on the day of the scan if it has not already been given at a prior hospital visit.

At the study visit once consent has been given/confirmed, the participant's demographic details will be recorded, a pregnancy test will be done for pre-menopausal women only, and the eligibility assessment will be confirmed.

An MRI safety questionnaire will be completed, and participants will change into MRI-compatible clothing if necessary. They will then have a single MRI scan session of the lungs, comprising three to five scans each lasting for approximately 2-7 minutes. For these, the participant will lie on the MRI scanner bed and a sensor (called an "RF coil") will be positioned around their chest. During the scan session, each participant will be asked to inhale the tracer gas mixture (21% oxygen, 79% perfluoropropane) for approximately 2-3 minutes, followed by no less than 5 minutes of breathing room air.

After the MRI scan session is finished, participation in the study will be complete.

### **Intervention Type**

Procedure/Surgery

### **Primary outcome(s)**

The percentage of ventilated lung volume (%VV) measured using fluorine MRI study data to characterise the extent of lung ventilation defects in the lungs of lung cancer patients before radiotherapy (single scan, baseline) at one time point

### **Key secondary outcome(s)**

Regional tracer gas wash-in and wash-out rates measured using the fluorine MRI scan, and clinical lung function measured using spirometry at baseline

### **Completion date**

30/08/2024

## **Eligibility**

### **Key inclusion criteria**

1. Aged 18 and over
2. Able to provide written informed consent to participate in the study
3. English speakers
4. Body weight within minimum and maximum scanner requirements of 50-100 kg

5. Diagnosed with non-small cell lung cancer by the clinical team
6. Planned to receive radical OR high dose palliative radiotherapy (+/- adjuvant chemotherapy or surgery)

**Participant type(s)**

Patient

**Healthy volunteers allowed**

No

**Age group**

Adult

**Lower age limit**

18 years

**Sex**

All

**Key exclusion criteria**

1. Patients below the age of 18 years
2. Patients who are not able or decline to give informed consent to participate in the study
3. Non-English speakers
4. Body habitus incompatible with positioning within the MRI scanner sensor used for 19F-MRI (approximately equivalent to a body circumference > 120cm at chest height, and body mass index > 35 kg/m<sup>2</sup>)
5. Pregnant or breastfeeding
6. MRI contraindications: incompatible implanted medical device (e.g. cardiac pacemaker), or metallic implants incompatible with MRI
7. Claustrophobia incompatible with MRI

**Date of first enrolment**

01/12/2023

**Date of final enrolment**

14/06/2024

**Locations****Countries of recruitment**

United Kingdom

**Study participating centre****Freeman Hospital**

Freeman Road  
High Heaton  
Newcastle upon Tyne  
United Kingdom  
NE7 7DN

# Sponsor information

## Organisation

Newcastle upon Tyne Hospitals NHS Foundation Trust

## ROR

<https://ror.org/05p40t847>

# Funder(s)

## Funder type

Research council

## Funder Name

Medical Research Council

## Alternative Name(s)

Medical Research Council (United Kingdom), UK Medical Research Council, Medical Research Committee and Advisory Council, MRC

## Funding Body Type

Government organisation

## Funding Body Subtype

National government

## Location

United Kingdom

# Results and Publications

## Individual participant data (IPD) sharing plan

The anonymised study imaging datasets and associated anonymised patient data generated during and/or analysed during the current study will be available upon request from Prof Pete Thelwall ([pete.thelwall@newcastle.ac.uk](mailto:pete.thelwall@newcastle.ac.uk)) and Dr Rachel Pearson ([rachel.pearson1@nhs.net](mailto:rachel.pearson1@nhs.net)) once study publication outputs are complete. Requests for anonymised study image data and associated anonymised patient data will be reviewed by the study senior team for no more than 5 years after the completion of publication outputs and data will be shared for academic research. Consent for the sharing of anonymised data is obtained from study participants.

## 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?
<a href="#">Participant information sheet</a>	version 1.1	18/10/2023	18/12/2023	No	Yes