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Detection of hypoxia (low oxygen) in lung cancer using imaging

Submission date 29/03/2018	**Recruitment status** No longer recruiting	[ ] Prospectively registered [ ] Protocol [ ] Statistical analysis plan [ ] Results [ ] Individual participant data [ ] Record updated in last year
Registration date 07/08/2018	**Overall study status** Completed	
Last Edited 17/12/2024	**Condition category** Cancer	

Plain English summary of protocol

Background and study aims
Researchers are trying to develop good methods to detect tumour cells that are hypoxic (contain low oxygen levels), as they are less likely to be killed by anti-cancer drugs or radiotherapy. We think that PET scans may be a reliable non-invasive method of obtaining this information. This study aims to investigate two types of special scan, called FAZA-PET and FMISO-PET, that could be used to detect low oxygen levels.

Who can participate?
Participants will include any lung cancer patient in NHS Grampian who is of good fitness and being considered for surgery or radiotherapy for the treatment of their lung cancer. Patients must have a biopsy (lung tissue sample) confirming the type of lung cancer. Patients must be over 18 and can be either male or female.

What does the study involve?
The study involves patients undergoing two PET/CT scans prior to their planned treatment for lung cancer. The scans will enable us to assess the oxygen levels in patients' tumours. The scans will be separated by a short period of 2 to 7 days. This will allow us to check how reliable the PET /CT scan test is by comparing the two scans with each other to see if they provide the same information.

What are the possible benefits and risks of participating?
There will be no immediate benefit to the patients participating but it will hopefully benefit lung cancer patients in the future. Patients will be required to spend two additional half days at the hospital for the scans to take place. There are no anticipated side effects from the scans.

Where is the study run from?
Aberdeen Royal Infirmary, NHS Grampian

When is the study starting and how long is it expected to run for?
The study will start from May 2018 and recruit for approximately 1 year until 20 patients have been recruited.

Who is funding the study?
The study is funded by Friends of ANCHOR, who have kindly funded the PET/scan costs for each patient.

Who is the main contact?
Dr Kirsten Laws, email kirstenlaws@nhs.net

Contact information

Type(s)
Public

Contact name
Dr Kirsten Laws

Contact details
Institute of Medical Sciences, University of Aberdeen, Foresterhill
Aberdeen
United Kingdom
Ab24 2ZN

Type(s)
Scientific

Contact name
Dr Kirsten Laws

Contact details
Institute of Medical Sciences, University of Aberdeen, Foresterhill,
Aberdeen
United Kingdom
Ab24 2ZN

Additional identifiers

Integrated Research Application System (IRAS)
200248

Study information

Scientific Title
Detection of hypoxia in non small cell lung carcinoma with [18F]FAZA-PET and [18F]FMISO-PET

Study objectives
The aim of this study is to use [18F]FAZA-PET and [18F]FMISO-PET to investigate whether non small cell lung carcinomas (NSCLC) may contain hypoxic regions and to compare reliability and reproducibility of the images produced by [18F]FAZA -PET and [18F]FMISO-PET retention in lung cancers when the only variable is time.
THe study will also assess and develop the optimum imaging protocol for [18F]FAZA and [18F]

FMISO in NSCLC and compare the reliability of the image produced by [18F]FAZA-PET and [18F] FMISO-PET with immunohistochemistry staining of tumour slices with intrinsic biomarkers of hypoxia (hypoxia-inducible factor 1α ;HIF1α) and carbonic anhydrase IX; CAIX)

Ethics approval required
Old ethics approval format

Ethics approval(s)
North of Scotland Research Ethics Committee, October 2016,16/NS/0085

Primary study design
Interventional

Study design
This is an observational study that will recruit 20 patients in total who will undergo a test-retest programme to ascertain if FAZA and FMISO hypoxia PET/CT scans are reproducible with time as the only variable.

Study type(s)
Screening

Health condition(s) or problem(s) studied
Non-small cell lung cancer

Interventions
The study will recruit 20 patients in total. The first 10 patients will undergo a test-retest with [18F]FAZA PET, with an initial [18F]FAZA scan, followed by a subsequent [18F]FAZA scan at an interval of 2-7 days.
A second set of 10 patients will undergo the same process with [18F]FMISO PET, with an initial [18F]FMISO PET followed by a subsequent [18F]FMISO PET at an interval of 2-7 days.
Tumour tissue will be collected as soon as practical after the second PET scan (within 2 days of the second scan). Three additional laboratory tests will be performed on the sample obtained from the patient's planned surgical procedure or biopsy. No additional surgical samples will be required other than the standard of care. The additional tests to be performed are however not standard of care and are being performed specifically for the biomarker part of the study. The tissue samples will be assessed by immunohistochemistry analysis of the expression of HIF1alpha and CAIX (Carbonic Anhydrase IX), and Ki67, which are well established intrinsic biomarkers of hypoxia and proliferation. These samples will provide additional information about the tumour and be compared to the results of the PET/CT scans.

Intervention Type
Other

Primary outcome(s)
The primary outcome measure will be to assess the reproducibility of the hypoxia PET/CT images with time as the only variable. Several metrics will be used to assess uptake, including Standardised Uptake Values (SUV), Tumour to Blood ratio (TBR) and Fractional Hypoxic volume (FHV). Reproducibility will be assessed by correlation between the values obtained for the two scans performed in each patient and an assessment of the voxel distribution and spatial correlation between the two scans will also be performed.

Key secondary outcome(s)
1. Correlation of SUV, TBR and FHV calculated by imaging with intrinsic hypoxia biomarkers by immunohistochemistry analysis of HIF1alpha and CAIX (Carbonic Anhydrase IX), expressed as a percentage and correlation performed with the metrics for uptake values for each scan.
2. Comparison of FAZA and FMISO images and reproducibility will be assessed by comparison of the degree of reproducibility as assessed by the above measures in the primary outcome
3. Optimisation of FAZA and FMISO imaging protocols will be performed during the clinical trial by assessment of the various uptake values and imaging parameters and the information obtained at each time point (dynamic and static) of the imaging protocol
4. Overall survival (months) will be obtained for each patient in order that an assessment can be made of the correlation between tracer uptake, as measured above, and overall survival in months

Completion date
01/12/2025

Eligibility

Key inclusion criteria
1. Histopathological confirmation of a diagnosis of non small cell lung cancer
2. Reasonable performance status (WHO performance status 0-1)
3. Medically fit and eligible for curative surgical resection or radical chemoradiotherapy
4. Able to give informed consent

Participant type(s)
Patient

Healthy volunteers allowed
No

Age group
Adult

Sex
All

Key exclusion criteria
1. Diagnosis of small cell lung cancer (SCLC)
2. WHO performance status of ≥2
3. Pregnant
4. Required to start treatment as an emergency (within 7 days)
5. Not suitable for surgical resection or radical chemoradiotherapy

Date of first enrolment
26/03/2018

Date of final enrolment
01/12/2025

Locations

Countries of recruitment
United Kingdom

Scotland

Study participating centre
Aberdeen Royal Infirmary
Foresterhill
Aberdeen
United Kingdom
Ab42 2ZN

Sponsor information

Organisation
NHS Grampian

ROR
https://ror.org/00ma0mg56

Funder(s)

Funder type
Not defined

Funder Name
Friends of ANCHOR

Funder Name
NHS Grampian Endowment Fund

Funder Name
Aberdeen Lung Cancer Group Endowment Fund

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-publicly available repository within Aberdeen Royal Infirmary, NHS Grampian. The data will be shared via means of presentation within a scientific paper, with all patient details fully anonymised. The data shared will include outcome measures of scans, degree of hypoxia identified, correlation between scans and immunohistochemistry results.

IPD sharing plan summary

Stored in repository

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
HRA research summary			28/06/2023	No	No
Participant information sheet	version v3	03/03/2018	07/08/2018	No	Yes