TEST

Lung PET scan

A lung PET scan uses a radioactive tracer to show areas of unusual activity in the lungs and elsewhere

WHAT IT MEASURES
Glucose-like tracer uptake in lung tissue and elsewhere

SAMPLE
None; PET/CT imaging after an intravenous tracer

FASTING NEEDED?
Yes, usually four to six hours; water is allowed

HOW LONG IT TAKES
Usually two to three hours

RESULTS IN
Usually several days; varies by imaging laboratory

USED FOR
Diagnosis support, cancer staging, treatment response, and recurrence

MAIN LIMITATION
Infection and inflammation can resemble cancer

Overview

A lung PET scan is an imaging test that shows how active tissues are. It is usually performed as a combined PET/CT scan. PET shows tissue activity, while CT provides detailed pictures of the lungs and other parts of the body.

Most lung PET scans use a small amount of a radioactive substance called fluorodeoxyglucose, or FDG. FDG is similar to glucose, the sugar used by cells for energy. Areas using more glucose than nearby tissue may appear brighter on the scan.

Cancer can take up more FDG, but it is not the only cause of increased uptake. Infection, inflammation and healing tissue can also appear active. A PET scan therefore cannot confirm lung cancer by itself.

The radioactive material loses activity quickly and leaves your body mainly through urine.

Why the test is ordered

A lung PET scan may be ordered after a chest X-ray or CT scan finds a lung nodule, mass or another area that needs further assessment. It can help estimate how active the area is and whether other parts of the body show similar changes.

If lung cancer has already been diagnosed, PET/CT may help show its extent. This is called staging. Staging can guide decisions about surgery, radiotherapy and other treatments.

The scan may also be used to:

PET is not normally used as the main lung cancer screening test. Low-dose CT is the imaging test used in lung screening programmes for eligible people.

- Help choose the safest or most useful area for a biopsy
- Assess how a cancer has responded to treatment
- Look for cancer that may have returned
- Help plan radiotherapy

Who should have the test

You may be offered a PET/CT scan if another scan shows a lung abnormality with enough concern or uncertainty to need more information. Not every lung nodule requires PET. Very small nodules may be better assessed with repeat CT because PET may not detect them reliably.

A PET scan may also be appropriate when treatment planning requires information about lymph nodes or possible disease outside the lung.

Tell the imaging team before your appointment if you:

These points do not always prevent the scan. They may change its timing or how it is performed.

- Have diabetes or problems controlling your blood sugar
- Are pregnant or could be pregnant
- Are breastfeeding
- Have recently had surgery, radiotherapy, chemotherapy or an infection
- Take insulin, steroids or medicines that affect blood sugar
- Have severe claustrophobia or difficulty lying flat
- Have kidney problems, particularly if CT contrast may be used

How to prepare

Follow the instructions from your imaging centre, as preparation protocols differ. You will usually be asked not to eat for four to six hours beforehand. Plain water is generally allowed and encouraged.

Avoid sweets, chewing gum, milk, juice and drinks containing sugar during the fasting period. Coffee is often not allowed, even without milk or sugar, because caffeine and other ingredients may affect preparation requirements.

Avoid strenuous exercise for about 24 hours if your centre advises this. Exercise can increase FDG uptake in muscles and make the scan harder to interpret. Try to stay warm before and during the appointment because shivering and cold-activated fat can also take up the tracer.

Do not alter insulin or other diabetes medicines on your own. The timing of food, insulin and the scan needs to be coordinated. Contact the imaging centre beforehand for a diabetes-specific plan.

Wear comfortable clothing without metal if possible. You may be asked to remove jewellery, a belt, hearing aids or other metal items.

What happens during the test

A member of the imaging team will review your preparation and may check your blood glucose. If it is too high, the scan may need to be delayed because excess glucose can compete with FDG and reduce image quality.

A small plastic tube called a cannula is placed into a vein, usually in your arm or hand. The FDG tracer is injected through it.

You then rest quietly, commonly for about an hour, while the tracer moves through your body. Talking, walking and using your muscles may affect where it collects. You may be asked not to read, chew or use your phone during this period.

For the scan, you lie on a narrow bed that moves through a ring-shaped scanner. The scanner is open at both ends. You need to keep still, and you may be asked to hold your breath briefly for part of the CT scan.

Imaging usually takes about 20 to 40 minutes, although the full appointment often lasts two to three hours. Some CT scans use an iodine-based contrast injection, but many PET/CT examinations use only a low-dose CT without contrast.

Understanding your results

A radiologist or nuclear medicine specialist reviews the PET and CT images together. The report describes where FDG uptake is increased, how it compares with nearby tissue and what the CT images show.

Reports may include a standardized uptake value, or SUV. This is an estimate of how much tracer an area has absorbed. There is no single SUV that reliably separates cancer from non-cancerous tissue.

A higher uptake can raise concern, but infection, inflammation and recent treatment can produce the same pattern. Some cancers have little FDG uptake and may not appear clearly.

Interpretation varies with the imaging laboratory, scanner, technique, age, sex, pregnancy status, medicines and overall clinical context. Your result should be considered alongside previous scans, symptoms and any biopsy findings.

Possible report conclusions include:

- No concerning abnormal uptake
- Uptake that needs comparison or follow-up imaging
- An area where biopsy may be useful
- Findings suggesting disease in lymph nodes or elsewhere
- An uncertain result that cannot distinguish cancer from inflammation

What affects the results

Several factors can change FDG uptake even when the scanner and laboratory have worked correctly.

Eating shortly before the scan or having high blood glucose can reduce the contrast between abnormal and normal tissue. Insulin taken close to the tracer injection can move FDG into muscles and fat.

Recent strenuous exercise can cause strong muscle uptake. Shivering, anxiety-related muscle tension and cold-activated "brown fat" can also create distracting bright areas.

Infection and inflammatory conditions, including pneumonia, tuberculosis, sarcoidosis and some fungal infections, may resemble cancer. Recent surgery, biopsy, radiotherapy or other treatment can cause healing-related uptake. Medicines that stimulate blood cell production can increase activity in bone marrow and the spleen.

Breathing movement can blur small abnormalities near the diaphragm. Kidney function can affect tracer clearance and matters particularly when iodine CT contrast is being considered.

Pregnancy changes how radiation risks are assessed. Age, sex and medicines may also influence normal uptake patterns or how the result is interpreted. A recent blood transfusion does not usually have an important direct effect on lung FDG uptake.

Accuracy and limitations

PET/CT is useful for assessing many lung abnormalities, but it can be wrong in both directions.

It may indicate possible cancer when no cancer is present. This happens especially with infection, inflammation, healing tissue and granulomas, which are small areas of immune-cell inflammation.

It may also miss cancer. Very small nodules can be below the scanner's resolution. Some slow-growing lung cancers, carcinoid tumours and certain adenocarcinomas may take up little FDG. High blood glucose, movement and poor preparation can further reduce detection.

PET/CT cannot reliably show whether every abnormal area is cancer. A biopsy, in which tissue is removed and examined under a microscope, is often the better test when confirmation would change treatment.

Repeat CT may be more useful for monitoring a small nodule over time. MRI is usually better for detailed assessment of the brain, and other tests may be needed for specific organs.

Risks and complications

The cannula can cause brief discomfort, a small bruise or light-headedness. Serious reactions to FDG are uncommon.

PET/CT exposes you to ionising radiation from both the tracer and CT scan. The clinical team weighs this exposure against the expected benefit of the information.

If iodine contrast is used for the CT portion, there is an additional risk of an allergic reaction and, in some people, kidney injury. The team may check your history or kidney function first.

Tell staff immediately if you develop breathing difficulty, facial or throat swelling, widespread hives or feel faint after contrast. These symptoms need urgent assessment. Mild soreness or a small bruise at the injection site can usually be managed routinely, but increasing pain or swelling should be reported.

What happens next

You can usually eat, drink and return to normal activities after the scan. Drinking water and passing urine regularly helps clear the tracer. Follow any instructions about close contact with pregnant people or young children for the rest of the day.

A clinician involved in your care will discuss the report with you. Routine next steps may include comparison with earlier imaging, another CT after a set interval, a biopsy or referral to a specialist team.

An uncertain or abnormal PET result does not by itself establish a diagnosis. Further testing is common because PET findings must be matched with the CT appearance and your wider medical information.

Common questions

Can I drink coffee before a lung PET scan?

Usually not during the fasting period, even if it is black. Plain water is generally allowed. Follow the specific instructions from your imaging centre.

Does the time of day matter?

The scan can be performed at different times, but fasting and diabetes medicines must be timed correctly. Morning appointments may be easier for some people with diabetes.

Can I exercise beforehand?

Avoid strenuous exercise for the period specified by the imaging centre, often the day before. Exercise can make muscles absorb more tracer and interfere with interpretation.

Can I take my usual medicines?

Many medicines can be continued with water, but diabetes medicines need special planning. Do not stop prescribed medicine unless your care team or imaging centre tells you to.

Can I drive after the scan?

Most people can drive afterward because FDG does not make you drowsy. Arrange help if you receive a sedative for severe claustrophobia or cannot travel safely for another reason.

Will I be radioactive afterward?

A small amount of radiation remains for a limited time and decreases quickly. Follow the centre's instructions about hydration and temporary close contact with pregnant people or young children.

Sources

- Boellaard R, Delgado-Bolton R, Oyen WJG, et al. "FDG PET/CT: EANM procedure guidelines for tumour imaging: version 2.0." European Journal of Nuclear Medicine and Molecular Imaging . 2015;42:328-354.
- National Institute for Health and Care Excellence. Lung cancer: diagnosis and management (NG122) . Published 2019, updated 2024.
- Callister MEJ, Baldwin DR, Akram AR, et al. "British Thoracic Society guidelines for the investigation and management of pulmonary nodules." Thorax . 2015;70(Suppl 2):ii1-ii54.
- American College of Radiology and Radiological Society of North America. PET/CT . RadiologyInfo.org. Reviewed May 2024.
- NHS. PET scan . NHS health information. Reviewed November 2023.
- U.S. Food and Drug Administration. Fludeoxyglucose F 18 Injection prescribing information . Drug label information for diagnostic PET imaging.