TEST

PET scan for breast cancer

An FDG PET/CT scan shows areas of increased glucose use that may indicate breast cancer spread or treatment response.

WHAT IT MEASURES
Areas using more radioactive glucose than surrounding tissue

SAMPLE
None

FASTING NEEDED?
Yes, usually 4-6 hours before the tracer injection

HOW LONG IT TAKES
About 2-3 hours, including preparation and scanning

RESULTS IN
Often several days; laboratory and reporting times vary

USED FOR
Staging, recurrence assessment, and treatment monitoring

MAIN LIMITATION
Increased glucose use is not specific to cancer

Overview

A positron emission tomography scan, or PET scan, uses a small amount of radioactive tracer to show activity inside the body. For breast cancer, the tracer is usually fluorodeoxyglucose, called FDG. It behaves like glucose, a type of sugar.

Cells that use more glucose collect more FDG and appear brighter on the images. Some cancer cells do this, but so can inflammation, infection, healing tissue, muscles, and normal organs.

Most breast cancer PET scans are combined with computed tomography, or CT. PET shows cell activity, while CT provides detailed pictures of body structures. The combined test is called an FDG PET/CT.

PET/CT is not a routine breast screening test. It does not replace mammography, breast ultrasound, breast MRI, or a biopsy. A biopsy, which removes cells or tissue for laboratory testing, is usually needed to confirm whether an area contains cancer.

Why the test is ordered

PET/CT may be ordered when information about the whole body could affect treatment planning. It is most useful when there is a meaningful chance that breast cancer has spread beyond the breast and nearby lymph nodes.

Reasons may include:

PET/CT is generally not used to screen people without symptoms. It is also not routinely needed for every early breast cancer because small or low-activity tumours may not appear clearly, while unrelated areas of FDG uptake can lead to more tests.

- Staging a newly diagnosed, higher-risk or locally advanced breast cancer
- Looking for cancer that may have returned after treatment
- Clarifying an uncertain finding from CT, MRI, or a bone scan
- Checking how metastatic breast cancer is responding to treatment
- Helping select the safest or most useful area for a biopsy

Who should have the test

Your cancer team may consider PET/CT if your examination, symptoms, laboratory results, cancer stage, or other scans raise questions about spread or recurrence. Whether it is useful also depends on the type of breast cancer and what information is needed for treatment.

Tell the imaging team before the appointment if you:

Pregnancy does not automatically mean the scan cannot be done, but the benefits and radiation exposure need careful review. Breastfeeding instructions depend on the tracer and local safety procedures.

- Have diabetes or problems with low or high blood glucose
- Are pregnant, might be pregnant, or are breastfeeding
- Recently had surgery, radiotherapy, chemotherapy, an infection, or a vaccination
- Take insulin, metformin, steroids like prednisone or hydrocortisone , or medicines that stimulate bone marrow
- Cannot lie flat or remain still
- Have severe anxiety in enclosed spaces

How to prepare

Follow the instructions from your imaging centre, even if they differ from general advice. Preparation affects how FDG is distributed and can determine whether the images are useful.

You will usually be asked not to eat for about 4 to 6 hours before the tracer injection. Plain water is normally allowed and encouraged. Avoid sweets, chewing gum, mints, milk, juice, and other drinks containing calories during the fasting period.

The centre may ask you to avoid strenuous exercise for the day before the scan. Exercise can make muscles take up FDG and hide nearby findings.

If you have diabetes, ask for specific instructions in advance. Do not change insulin or other diabetes medicines on your own. The timing of food, medicine, and the appointment may need to be coordinated.

Wear warm, comfortable clothing without metal if possible. Staying warm can reduce FDG uptake in brown fat, a normal type of fat that produces heat.

What happens during the test

A staff member will review your preparation and may check your blood glucose. A small intravenous line is placed into a vein, usually in your arm or hand. The FDG tracer is then injected.

You will rest quietly for about an hour while the tracer moves through your body. You may be asked not to talk, chew, read, or use your phone because muscle activity can affect uptake.

Before scanning, you will usually empty your bladder. You then lie on a narrow table that moves through the PET/CT scanner. The scanner is open at both ends.

The scan itself often takes about 20 to 30 minutes. You need to remain still, but the test should not be painful. Some CT scans use an additional iodine-based contrast injection; the team will tell you if this is planned.

The entire appointment commonly lasts 2 to 3 hours.

Understanding your results

A nuclear medicine doctor or radiologist reviews the PET and CT images together. The report describes where FDG has collected, what the CT shows, and whether the findings have changed from previous scans.

Uptake may be described using a standardized uptake value, or SUV. This is an estimate of how

much tracer is present in an area. A higher SUV does not by itself prove that an area is cancer, and a low SUV does not rule cancer out.

There is no universal normal SUV for breast cancer. Numeric thresholds and interpretation vary by imaging centre or laboratory, scanner, age, sex, pregnancy status, medicines, and clinical context.

The report may classify a finding as likely benign, suspicious, uncertain, improved, stable, or progressed. Your team interprets the result alongside the breast cancer subtype, previous treatment, symptoms, examination, and other imaging.

What affects the results

Several factors can change FDG uptake even when the scanner and laboratory are working correctly.

High blood glucose can compete with FDG and make some cancers harder to see. Insulin given too close to the injection can send FDG into muscles and fat. This is why diabetes planning and a pre-scan glucose check may be important.

Recent strenuous exercise can cause strong muscle uptake. Talking, chewing, shivering, or being cold during the uptake period can also make muscles or brown fat appear unusually active.

Inflammation and infection commonly take up FDG. Recent surgery, biopsy, radiotherapy, vaccination, or tissue healing may therefore resemble active cancer. Bone marrow can appear very active after chemotherapy or medicines that stimulate white blood cell production.

Other influences include:

Providing accurate dates for recent treatments, procedures, vaccinations, and medicines helps the reader of the scan avoid misleading conclusions.

- Very small tumours, which may be below the scanner's resolution
- Breast cancers that naturally use little FDG, including some lobular cancers
- Metformin, which can cause increased bowel uptake
- Movement, breathing, or differences in PET and CT positioning
- Timing between the tracer injection and imaging
- Kidney and bladder clearance, which places tracer in the urinary system
- Different scanners, image-processing methods, and prior treatment

Accuracy and limitations

PET/CT can find cancer in lymph nodes, bones, and organs that was not clear on other imaging. However, its accuracy is not the same in every situation, so there is no single useful percentage for all breast cancers.

The scan can miss disease when an area is too small, contains cells that take up little FDG, or is close to tissue with naturally high uptake. The brain normally uses large amounts of glucose, for example, so MRI is usually better for evaluating suspected brain metastases.

PET/CT can also suggest cancer when none is present. Infection, arthritis, healing injuries, surgery, radiotherapy, and other inflammation may all look active.

Mammography, ultrasound, or breast MRI is usually better for examining the breast itself. CT or MRI may better define certain organs, and a biopsy is often the better test when tissue confirmation would change treatment. Comparing the scan with older images reduces, but does not remove, uncertainty.

Risks and complications

The IV can cause brief discomfort, a small bruise, or light-headedness. The injected FDG rarely causes an allergic reaction.

PET/CT exposes you to ionising radiation from both the tracer and the CT scan. The amount is limited, but it is important to mention pregnancy or possible pregnancy before exposure.

If iodine-based CT contrast is used, you may briefly feel warm or notice a metallic taste. Contrast can rarely cause an allergic reaction and may require extra planning if you have reduced kidney function or a previous contrast reaction.

What happens next

You can usually eat, drink, and return to normal activities after the scan. Drinking fluids and urinating regularly helps remove the tracer. Follow any temporary instructions about close contact with pregnant people or young children.

A routine follow-up appointment or phone call is usually arranged to explain the report. An uncertain result may lead to comparison with earlier scans, repeat imaging, a different type of scan, or a biopsy.

Contact the imaging centre if the IV site becomes increasingly painful, swollen, or red. If

contrast was used, seek emergency help for trouble breathing, swelling of the face or throat, fainting, or a rapidly spreading rash.

Common questions

Can I drink coffee before a PET scan?

Usually not during the fasting period, even if it is black. Coffee can affect glucose levels or muscle activity. Plain water is generally the safest choice unless your centre says otherwise.

Does the time of day matter?

The scan can be performed at different times, but scheduling matters if you have diabetes or use insulin. A morning appointment may make fasting and medicine timing easier.

Can I exercise beforehand?

Avoid strenuous exercise for the period specified by the imaging centre, often the day before the scan. Walking gently for normal daily activities is usually acceptable.

Can I take my regular medicines?

Many medicines can be continued with water, but diabetes medicines, insulin, steroids, metformin, and bone marrow-stimulating medicines may need special planning. Follow the instructions given for your appointment.

Can I drive home afterward?

Most people can drive because sedation is not normally used. Arrange help if you receive a sedative for anxiety or feel unwell after the appointment.

Can I breastfeed after the scan?

Tell the nuclear medicine team before receiving FDG. You may be given temporary instructions about expressing milk or limiting close contact; the timing is based on the tracer and local radiation-safety policy.

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.

- [European Association of Nuclear Medicine and Society of Nuclear Medicine and Molecular Imaging. Joint guideline on the role of 2-[18F]FDG PET/CT in breast cancer. European Journal of Nuclear Medicine and Molecular Imaging . 2024.](https://link.springer.com/article/10.1007/s00259-024-06696-9)
- National Institute for Health and Care Excellence. Early and locally advanced breast cancer: diagnosis and management (NG101) .
- Radiological Society of North America and American College of Radiology. PET/CT . RadiologyInfo.org.
- U.S. National Library of Medicine. Fludeoxyglucose F 18 injection: prescribing information . DailyMed.