TEST

Brain PET scan

A brain PET scan uses a radioactive tracer to show brain activity or specific proteins.

WHAT IT MEASURES
Brain metabolism or specific proteins, depending on the radioactive tracer

SAMPLE
None

FASTING NEEDED?
Sometimes, usually 4-6 hours for FDG scans

HOW LONG IT TAKES
About two hours, including tracer uptake and imaging

RESULTS IN
Several days; timing varies by imaging laboratory

USED FOR
Diagnosis, treatment planning, and monitoring

MAIN LIMITATION
Abnormal tracer uptake is not specific to one condition

Overview

A brain positron emission tomography scan, or brain PET scan, shows how parts of the brain are working or whether certain substances have built up.

Before the scan, you receive a small amount of a radioactive tracer , usually through a vein. The scanner detects the tracer and maps its distribution.

Different tracers answer different questions. Fluorodeoxyglucose, or FDG , behaves like glucose and shows how actively brain cells use sugar. Other tracers can show amyloid or tau proteins associated with Alzheimer's disease or examine particular chemical signalling systems.

PET provides functional information rather than detailed pictures of brain structure. It may be combined with CT or compared with MRI.

Why the test is ordered

A brain PET scan may be ordered when other information does not fully explain symptoms.

The reason for the scan determines the tracer used.

Possible reasons include:

PET usually adds to a medical history, examination, cognitive testing and other scans. It rarely provides a diagnosis by itself.

- Evaluating memory or thinking problems
- Helping distinguish between causes of dementia
- Locating where seizures may begin before epilepsy surgery
- Assessing some brain tumours or possible recurrence
- Measuring amyloid or tau when the result could affect care
- Examining selected movement disorders
- Supporting treatment planning or monitoring

Who should have the test

Brain PET is generally used when a specialist believes the result could clarify a diagnosis or change treatment. It is not usually a routine screening test for people without symptoms.

For memory problems, its value depends on your symptoms, age, previous results and whether the finding would affect care. Amyloid in the brain does not by itself prove that Alzheimer's disease is causing symptoms.

Tell the imaging team if you are pregnant, could be pregnant or are breastfeeding. Because PET involves radiation, the scan may need to be postponed, changed or performed with extra precautions.

Also report diabetes, severe anxiety in enclosed spaces, difficulty lying flat or trouble keeping still. These may change the preparation.

How to prepare

Your imaging centre's instructions take priority because preparation varies by tracer. For an FDG brain PET scan, you may be asked to:

Coffee, tea, energy drinks, flavoured water and chewing gum may break the fast. Ask whether black coffee is allowed.

If you have diabetes, contact the centre before your appointment. Food, glucose, insulin and

some diabetes medicines can affect FDG images. Do not change insulin or other medicines without an individual plan.

You may need to rest quietly before imaging. Talking, reading, using your phone or exposure to bright light can change activity in parts of the brain.

- Avoid food for 4 to 6 hours beforehand
- Drink plain water while fasting
- Avoid strenuous exercise for about a day
- Take regular medicines unless told otherwise
- Bring a medicines list and relevant previous scans
- Wear comfortable clothing without unnecessary metal

What happens during the test

The imaging team confirms the reason for the scan and checks your preparation. Before an FDG scan, your blood glucose may be tested.

An intravenous line is placed in your arm or hand, and the tracer is injected. It usually does not make you feel different.

You then rest quietly for 30 to 60 minutes while the brain takes up the tracer. For imaging, you lie on a table that moves through a short, ring-shaped scanner. Your head may be supported to limit movement. Imaging commonly takes 15 to 30 minutes.

The appointment usually lasts about two hours but may take longer if you need delayed images, sedation or additional CT imaging.

Understanding your results

A nuclear medicine doctor or radiologist interprets the images alongside your symptoms and other tests.

An FDG scan may show brain areas using more or less glucose than expected. Patterns can support certain causes of cognitive decline, help locate a seizure focus or assess tumour tissue. However, similar patterns can have different causes.

An amyloid PET report describes whether significant amyloid plaque is present. A positive result does not prove Alzheimer's disease because amyloid can occur in older people without dementia. A negative result makes Alzheimer's disease caused by substantial amyloid buildup

less likely at that time but does not explain other possible causes of symptoms.

There is no universal normal range. Interpretation depends on the tracer, imaging laboratory, age, medicines and clinical context.

What affects the results

Factors that can alter tracer uptake or image quality include:

Tell the team about recent procedures, seizures and all medicines or substances you use. Report a recent transfusion as part of your medical history, although it does not usually affect PET directly.

- High blood glucose, recent insulin or eating when fasting was required
- Recent strenuous exercise
- Talking, reading or sensory stimulation
- Movement during imaging
- Sedatives, stimulants and some neurological medicines
- A recent seizure
- Stroke, inflammation, surgery or radiation treatment
- Brain shrinkage and limitations in image resolution
- Differences in scan timing, equipment or image processing

Accuracy and limitations

Accuracy varies by tracer, condition, disease stage, preparation and interpretation. No single accuracy figure applies to every brain PET scan.

PET may miss very small abnormalities because its spatial resolution is lower than MRI. Early disease, tumours with low tracer uptake or poor preparation may also produce an apparently normal result.

Inflammation, healing tissue, seizures and age-related changes can cause abnormal uptake when the suspected condition is absent. Amyloid may also be present when symptoms have another cause.

PET is therefore not a simple yes-or-no test. MRI is usually better for detailed brain structure, bleeding and small lesions. Blood or cerebrospinal fluid biomarkers may sometimes be more

appropriate for Alzheimer-related proteins, while prolonged EEG monitoring records seizure activity more directly.

Risks and complications

The intravenous line may cause brief discomfort, bruising or light-headedness. Infection or significant bleeding is uncommon.

PET exposes you to a small amount of ionising radiation. A combined CT adds radiation, particularly if it is a diagnostic CT. The tracer loses radioactivity over time and leaves mainly through urine.

Allergic reactions to PET tracers are uncommon. CT contrast and sedation have separate risks that the team should explain.

Afterward, drink fluids and urinate regularly if instructed. Follow guidance about close contact with pregnant people or young children, as precautions vary by tracer and dose.

Seek emergency help for trouble breathing, facial or throat swelling, collapse or another severe reaction. Contact the imaging service if injection-site swelling, redness or pain worsens.

What happens next

A specialist sends a report to the clinician who ordered the test, usually within several days. The result may be reviewed with MRI or CT findings, cognitive tests, EEG results, laboratory tests or biopsy results. Further testing is not always needed.

Attend the planned follow-up appointment to discuss the report and next steps. Do not wait for the PET result if you develop sudden weakness, difficulty speaking, a new prolonged seizure, severe confusion or another possible medical emergency.

Common questions

Can I drink coffee before a brain PET scan?

Often not during fasting. Even black coffee may affect preparation or brain activity. Plain water is usually allowed, but follow your centre's instructions.

Can I exercise beforehand?

Avoid strenuous exercise if instructed, often from the day before an FDG scan. Exercise can increase muscle uptake and interfere with interpretation.

Does the time of day matter?

Usually less than fasting, medicine timing and consistent preparation. It may matter if you use insulin, have seizures following a pattern or need comparison with an earlier scan.

Can I take my usual medicines?

Often yes, but some medicines affect glucose or brain activity. Provide a complete list and do not stop prescribed treatment unless specifically instructed.

Can I drive home afterward?

Usually, provided you did not receive a sedative. If sedation is planned, arrange transport and follow the centre's restrictions.

Will I be radioactive afterward?

A small amount of tracer remains for several hours and decreases naturally. Follow instructions about fluids and temporary close contact with young children or pregnant people.

Sources

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