



Neuroimaging

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What is neuroimaging?

Neuroimaging is imaging of the brain. There are various types of brain imaging (scans) for example computed tomography (CT) and magnetic resonance imaging (MRI). These can be used to help diagnose a number of different medical illnesses.

What brain scans can do?

- Show damage to brain tissue, the skull, or blood vessels in the brain for example brain tumours, bleeding, blood clots or other signs of stroke, skull fractures (broken bones) or infections. As well as damages to the brains structures it can also show abnormal brain signalling.
- Be used with other medical tests to help doctors find the right diagnosis for example along with blood tests and assessment of cerebrospinal fluid (CSF, the fluid bathing the brain).
- Help researchers study healthy brain development, the effects of certain illness or the effects of treatments on the brain.

What brain scans cannot do?

- Diagnose mental illness.
- Tell you which bugs specifically are causing infection.
- Tell us what you are thinking

What types of brain scans, or neuroimaging tests, are there?

There are two main types: structural and functional.

- Structural imaging creates snapshots of the brain's structure, including bone, tissue, blood vessels, tumour, damage or bleeding such as from a stroke. Examples include CT scan and MRI.
- Functional imaging reveals the brain's ever-changing activity and chemistry by measuring rate of blood flow, chemical activity or electrical impulses in the brain during rest and specific tasks. Examples include PET (positron emission tomography) scan.

Imaging can assess and help diagnose encephalitis and give better understanding into how it has affected the brain. After diagnosis the effectiveness of drug intervention using these techniques is beneficial.

Different causes of encephalitis require varying treatment courses. This can tell us, along with symptoms, bloods and CSF, how well the inflammation has cleared and how much damage has been caused.

What is MRI?

MRI is an imaging technique, which does not use harmful radiation to capture the image, instead it uses a powerful magnet and radio waves. Several images are taken and then reconstructed into a composite image.

What is a CT scan?

CT scan (also known as a CAT scan) is a computerized x-ray procedure that produces cross-sectional images which are far more detailed than plain x-ray films.

Are there risks associated with brain scans?

Brain scans are relatively safe and do not cause any pain. However, there are risks associated with radiation (e.g. CT and PET scan), but safety measures are used to limit these risks. For example, the lowest possible radiation is used to do the scan.

There is no radiation involved in MRI scans and they are very safe for most people. However, people with internal medical devices or implants, regardless of where these devices are, must not have an MRI without informing doctors, due to the effect that the strong magnet can have which may have serious consequences. Alert your doctor if you have any of the following:

- a cardiac (heart) pacemaker
- clips in your skull from brain operations: e.g. aneurysm clips
- a cochlear (ear) implant
- neurostimulator
- a metallic foreign body in your eye
- a programmable shunt for hydrocephalus (fluid on the brain)
- fixed dental braces
- joint replacements
- vascular (blood vessels) stents

Some of the above have been made in materials that are safe to enter the MRI machine, but it is always best to alert the doctor.

Children and teens may be more sensitive to these risks. If your child needs a brain scan, you can ask if special precautions can be taken or whether a different type of scan can be used. Women who are pregnant or breastfeeding should also mention this to their doctor. Whilst most types of scans pose little risk to the developing baby, the doctor may make different recommendations to accommodate for these situations.

Another possible risk is claustrophobia, or fear of small spaces. Many brain scan machines look like large tubes or giant 'donuts' that are open at each end. The machines can be quite loud while the scanning takes place and for this reason ear defenders or ear plugs are used or head phones with music. It is also important to stay still in order to get a clear picture. Tell your doctor if you are afraid of being inside or if you think you will not be able to stay still for any reason. Sedatives can occasionally be prescribed to reduce anxiety.

Sometimes a contrast dye is injected into the blood stream to highlight different tissues in the brain. Patients may feel a warm or cool sensation as the dye circulates or they may experience a slight metallic taste momentarily.

Talk with your doctor to make sure you understand the possible risks and benefits before getting any brain scan.

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Thank you!

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