

Computed tomography (CT scans)

What is computerised tomography?

Computerised tomography (CT) scanning is used commonly in medicine today. It is similar to conventional radiology as it uses X-rays.

Computerised tomography is also referred to as computed tomography.

In order to obtain a computerised tomography scan, patients lie in a CT scanner – similar to a bed inside a 'Polo® mint'. The X-ray tube and the detectors are opposite to each other. Both of these rotate around the patient and information is obtained, usually in slices. The data are constructed by a computer and provide, most commonly, cross-sectional images in a single plane, which can be interpreted.

The pictures are obtained by differences in X-ray absorption – compared with conventional radiology these differences are very small, allowing different shades of grey and distinction between different tissues – eg, between fat and soft tissues and between brain and cerebrospinal fluid.

What are the types of computerised tomography?

There are essentially two types of computerised tomography scans:

- **Conventional CT scan** – the scan is taken slice by slice and after each slice the scan stops and moves down to the next slice – eg, from the top of the abdomen down to the pelvis. This requires patients to hold their breath to avoid movement artefact.
- **Spiral/helical CT scan** – this is a continuous scan which is taken in a spiral fashion. It is a much quicker process and the scanned images are contiguous.

Computerised tomography scans can also be distinguished according to the plane in which the images are taken. In fact computerised tomography scanning has been called 'computed axial tomography (CAT)' scanning, describing axial images that are taken - axial being the most common plane. However, other planes of imaging can also be performed - eg, coronal or sagittal. Furthermore, the newer CT scanners can project these images into a 3D image.

When CT scans are produced the operator can choose the section level (eg, brain) and also the thickness of the sections. The thickness of the sections is usually between 1-10 mm - the thinner the slices, the more information in the images - although, with the spiral CT scans, this is superseded.

Advantages of computerised tomography scanning

- Better detail compared with ultrasonography.
- Relatively quick compared with MRI scanning.
- Most systems can be scanned - eg, brain to leg.

Disadvantages of computerised tomography scanning

- Requires breath holding which some patients cannot manage.
- Artefact is common - eg, metal clips.
- Computerised tomography scans of the brain can be affected by bone nearby.
- High doses of radiation are involved in CT scanning - chest CT scan is equivalent to 350 chest X-rays; CT abdomen to 400 chest X-rays and CT pulmonary angiography 750 chest X-rays^[1] ^[2] . However, the consensus is that clinically, the dangers of such exposure in adults are small and less of a risk than withholding CT if it is required for diagnostic purposes^[3] .

- The situation regarding exposure to unborn babies during pregnancy is however different. There is a risk of childhood cancer and leukaemia in mothers who have imaging during pregnancy^[2] . However, some of the studies are small and difficult to interpret due to confounding factors. Imaging to aid potentially fatal conditions during pregnancy should not be withheld^[4] .
- In children, it is preferable to use modalities which do not involve exposure to ionising radiation, such as ultrasound and MRI, if possible^[3] .

Computerised tomography scanning with contrast^[3]

Computerised tomography scanning provides images in shades of grey - occasionally the shades are similar, making it difficult to discern between two areas. Contrast enhancement can be used to try to overcome this problem. Barium is commonly used to outline the gastrointestinal tract; intravenous contrast is used to outline arterial blood vessels.

Some intravenous contrast agents are iodine-based and there is a risk of [anaphylaxis](#) with these and worsening of [acute kidney injury](#). Barium sulfate and gadolinium-based are non-ionic and are less likely to cause allergic reactions. However, they are more expensive.

Side-effects of intravenous contrast

- Injections are usually given rapidly and can cause a feeling of warmth in the arm, or even severe pain.
- Contrast can be extravasated, which can be severe enough to require skin grafting.
- Nausea and vomiting.
- [Urticaria](#).
- Anaphylaxis with bronchospasm, laryngeal oedema and hypotension.

- Renal failure – contrast is cleared renally and patients with pre-existing renal impairment may develop worsening renal function and even renal failure requiring haemodialysis (see 'Contrast-induced renal impairment', below).

Asthma and hypersensitivity to contrast agents

- Those with asthma are at increased risk of atopy and are, therefore, at an increased theoretical risk of anaphylaxis to intravenous contrast.
- Interestingly, a survey revealed that, although the use of non-ionic contrast media has increased, the use of premedication with steroids is being increasingly used. One study concluded that was unnecessary, as the risk of allergic reactions is low with non-ionic contrast media^[5]. However, the technique is still being employed, and a large systematic review to provide further evidence is underway at the time of writing^[6].

Contrast-induced renal impairment

- Contrast is excreted renally.
- If patients have [chronic kidney disease](#), diabetes mellitus or reduced intravascular volume then they run the risk of accumulating the contrast^[7].
- This can lead to worsening of renal impairment or even renal failure.
- Generally, good hydration prior to contrast will reduce the risk of developing renal impairment.
- Other factors that will reduce the risk are identifying high-risk patients early and stopping any nephrotoxic medicines^[8].
- Metformin is usually withheld before a computerised tomography scan.

- N-acetylcysteine (NAC) has also been used; it is given orally the day before and the day of the procedure. The efficacy of NAC is unclear, although a recent meta-analysis showed that NAC used prophylactically reduces the risk of contrast-related nephropathy.

Further reading

- [Committee on Medical Aspects of Radiation in the Environment \(COMARE\)](#)

Disclaimer: This article is for information only and should not be used for the diagnosis or treatment of medical conditions. Egton Medical Information Systems Limited has used all reasonable care in compiling the information but makes no warranty as to its accuracy. Consult a doctor or other healthcare professional for diagnosis and treatment of medical conditions. For details see our [conditions](#).

Authored by:	Peer Reviewed by: Dr Hayley Willacy, FRCGP	
Originally Published: 20/11/2023	Next review date: 19/10/2021	Document ID: doc_1656

View this article online at: patient.info/doctor/computerised-tomography-ct-scans

Discuss Computed tomography (CT scans) and find more trusted resources at [Patient](#).



To find out more visit www.patientaccess.com
or download the app



Follow us

