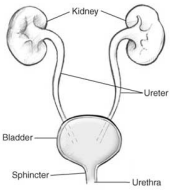


Radiation and its uses in diagnosis

Monash Children's Hospital

What is it?

Radiation is a way in which energy is transmitted. Radiation exists everywhere and we are all 'exposed' to radiation every day, wherever we live. The amount of radiation we are exposed to will vary depending on where we live and what we do.

There are different types of radiation: low energy, medium energy and high energy.

Low energy radiation is found in radio waves, microwaves and infrared. It is how you can feel the warmth of the sun.

Medium energy radiation can be seen as light.

High energy radiation can be harmful – eg UV light which can burn our skin. Xrays and gamma rays are other types of high energy radiation.

Medical uses of radiation

Some investigations or tests that doctors request use radiation.

Ionising radiation

- X-rays
- CT scans

Gamma rays

- nuclear kidney scans (MAG3, DTPA, DMSA)
- bone scans

Non-ionising radiation

- MRI scans
- ultrasound scans

Ionising radiation

Energy is sent from a source (x-ray machine or CT machine), with high enough energy to pass though the body.

X-ray

The machine produces X-rays to create a picture of hard and soft tissue. The strength of the x-ray is adjusted depending on the body size. The x-rays are aimed only at the part of your child's body the doctor is looking at.

The x-rays are caught on a film and turned into a picture. The machine does not produce any radiation when it is turned off.

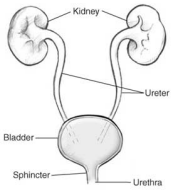
CT scan (computed tomography)

CT scanners use the same type of radiation as X-rays. The X-rays travel in a circle around your body and are captured on the other side. The images are reconstructed in a computer to give multiple pictures of slices through the body. They can also be reconstructed to create 3-dimensional images.

For these machines, the radiation is switched on and off only to take the picture. The radiation passes through the part of the body being examined. There is no radiation in the room or in your body once the machine is off.

Gamma rays

Gamma rays also involve high-energy radiation, like X-rays. In these tests, though, the radiation comes from a liquid that is injected into your child. A special camera then detects the radiation given off by the liquid as it travels around the body. After the procedure, your child will still be sending out radiation, usually for a matter of hours.



Radiation and its uses in diagnosis

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Non-ionising radiation

MRI (Magnetic Resonance Imaging)

This machine uses a large magnet with a central hole like a doughnut. Sensors pick up how much magnetism goes through the body and converts it to a picture.

Ultrasound

This uses high frequency sound waves that are reflected off the different surface in the body. Black and white pictures are seen on a small screen like a TV in the room.

Risks of radiation

Medical imaging is essential for the assessment and treatment of many diseases, but many involve ionizing radiation.

There *are* risks with ionizing radiation exposure from diagnostic studies. The main concern is that the radiation can increase the risk of cancer.

The risks are greater with increasing doses of radiation. The radiation dose delivered in a test will depend on the type of investigation, the area being imaged and the settings used.

Because the general population has a lifetime risk of cancer of 1 in 5, it is very hard to determine the exact additional risk conferred by a single CT scan or X-ray. In an adult, it is thought that the lifetime risk of cancer due to ionizing radiation from a CT scan is 1 in 5,000.

Every doctor will try and minimize the investigations performed, to lower the radiation exposure, whilst gathering the required information.