

## Imaging scans

There are a number of different types of scan that can be used to look at the joints and (in some cases) soft tissue areas in the body.

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### X-Rays (or radiographs) of affected joints

It is common for any joints where an abnormality is found during an examination of your child (such as swelling, heat, redness, pain, tenderness, reduction in the normal range of movement) to have an X-Ray. This is to look for any unexpected fractures, damage to the joint surfaces, very rare tumours,

cysts etc. An X-ray can also detect some changes in the soft tissues (such as showing fluid in the joint, or soft tissue swelling) but these have to be fairly marked to show up on X-Ray. They can also be used by doctors performing joint injections to help identify the correct position in the joint to inject.

## What is it?

An X-ray is a form of energy, similar to light or radio waves. It is also a form of radiation. X-rays can pass through the body to a plate where an image is formed of the inside bones and tissues. The machine is like a big camera. X-rays are quick and painless.

## What happens during an X-ray examination?

When your child goes for an X-ray they may need to change into a hospital gown and take off any jewellery they may be wearing. This is because some clothing and jewellery make it difficult to see the images clearly. There will be cubicles where they can change.

The X-ray room is usually dimly lit and depending on which part of their body needs an X-ray your child may have to lie on a bed or stand against a board, but the radiographer will help them get into the correct position for the X-ray to be taken.

When the radiographer is ready to take the X-ray they will go behind a screen to operate the X-ray machine but they will be able to see and hear your child at all times. Before the X-ray is taken your child will be asked to keep very still so the image isn't blurred.

Sometimes, the radiographer will have to take more than one X-ray from different angles to get as much information as possible. He/she will again help your child to get into the right position each time before taking the X-ray.

Parents can usually stay inside the room with their child whilst the X-ray is being taken unless you are pregnant. Before the X-ray is taken, you will be given a lead coat to wear. This will protect you from any radiation from the X-ray. Although the lead coat is heavy you will only need to wear it for a few minutes whilst the X-ray is being taken.

## What happens next?

The X-ray will be transferred to a computer so the doctor can look at this on a screen. Sometimes, they may also print out a copy. Once they have had a look at the X-ray they will send a report to the referring doctor who will discuss the results with you.

## Are there any risks from X-ray?

X-rays are made up of a type of radiation known as ionising radiation. However, the levels of radiation in an X-ray are very small. We are exposed to natural sources of radiation all the time termed 'background radiation'. An X-ray of hands or feet is equivalent to 3 hours of background radiation, and a chest X-ray is equivalent to around 10 days. All hospitals also have protocols to make sure patients are only exposed to the minimum dose and only in the part of the body being X-rayed, so there's no need for parents to worry.

# Ultrasound Scan (USS) of affected joints

## What is it?

An ultrasound scan is sometimes called a sonogram and is a harmless and painless procedure. It uses sound waves to create images of the soft tissues and the inside of joints and can show any swelling (synovitis), excessive fluid in the joint (effusion) or any damage to the smooth surfaces of the joint cartilage (erosion).

Most people will be familiar with ultrasound because they are used for looking at a growing baby during pregnancy.

## Who needs it?

This is not an essential or even necessary examination in straightforward cases. However, it can help if there is any doubt about which joints are involved, whether any other tissues are affected (for example the tendons or 'pulleys') and whether there has been any damage (termed an 'erosive arthritis'). A few paediatric rheumatologists will perform their own USS in clinic. Others will refer to specialist radiologists who will perform the scan and send the doctor a report.

Ultrasound scans are usually carried out in the X-ray Department in a hospital by a doctor or a sonographer.

## What happens during an ultrasound scan?

The room where the ultrasound scan is performed is usually dimly lit. This helps the sonographer see the images more easily on the monitor. Your child will need to lie on an examination table and the sonographer will put some clear gel on the part of their body to be scanned. This gel is harmless, although your child may find it a little cold, and it helps the small pen-like device (probe) held by the sonographer to move smoothly over the skin and ensures there is continuous contact between the probe and the skin.

The probe is connected to a computer and a monitor and pulses of sound waves sent from the probe through your child's skin and into their body bounce back from structures inside your child's body and are displayed as an image on the monitor. Ultrasound scans are quick and you can usually stay with your child throughout the procedure. When the scan is finished the sonographer will write a report for the doctor who referred your child so you can discuss the results with them. Sometimes, ultrasound scans are also used to help guide the doctor during some joint injections.

## Are there any risks from ultrasound scans?

Ultrasound is considered to be a very safe imaging procedure because it uses low power sound waves and does not expose the patient to any forms of radiation.

# Computer Tomography (CT) Scan

## What is it?

CT scans are also sometimes referred to as a CAT scan. This stands for computer axial tomography. A CT scan is similar to an X-ray but instead of one image being taken the CT scanner takes lots of pictures to produce a 3-dimensional image. These images provide much more detail of the inside of the body and are really good for looking at blood vessels and soft tissue as well as bones. Like X-ray, CT uses radiation to produce these images.

## What happens during a CT scan?

A CT scanner looks like a large ring doughnut. Before the scan, your child may need to change into a gown and remove any hair clips or earrings as these can interfere with the scan. Your child will have to lie on a bed either head first or feet first depending on which part of their body is being scanned. The radiographer will help your child to get in the right position on the table so the scan can be performed. During the scan, the motorised bed moves into the centre of the scanner whilst the X-ray unit inside the scanner moves full circle around your child and takes the images.

CT scans are usually very quick but some scans may take a bit longer than others, it just depends on what part of the body is being imaged. It is very important that your child keeps very still whilst they are being scanned so the images are not blurred. The radiographer will sit in another room whilst the CT scan is taking pictures but will be able to hear and see your child throughout and be able to talk to them through an intercom to reassure them.

## Are there any risks from CT scans?

CT scans use a slightly higher radiation dose than X-ray and so doctors limit their use in children. However, don't worry if your child is referred for a CT scan because their doctor will have weighed up risks and decided this is the best type of examination for them.

## Magnetic resonance imaging (MRI)

### What is an MRI?

Magnetic resonance imaging (MRI) is another type of imaging. It uses a magnet and radio signals to produce clear images of the inside of the body and is really good at showing bone, soft tissues, internal organs and blood vessels. Like CT images, MRI images are also 3-dimensional but unlike ultrasound it only produces static images and is not suitable for examination of moving joints.

### Who needs it?

It is not very common for children with suspected arthritis to need an MRI scan. If there is sufficient doubt about the cause of the child's problems then a scan may be needed. Where joints are very deep and not so easy to examine (for example, the hips, the spine, or the joints of the pelvis – sacroiliac joints) an MRI may be valuable. Where there is a history of a probable injury at the outset of the problem an MRI can detect this. If there is concern that a child with known arthritis is not better on treatment or may be developing damage an MRI may help determine the extent of the problem.

## What happens during an MRI scan?

The MRI scanner is like a wide tunnel, some longer than others. Before your child has an MRI you will be asked to fill in a questionnaire about your child. This is a safety precaution and will ask about any implants your child has because, although MRI is generally safe there are some implants, such as pacemakers, which cannot go into the scanning area.

Your child will need to lie on a bed in front of the MRI scanner. The radiographer will help your child get into the right position and sometimes, they may also put another piece of equipment around the part of the body the doctor wants to take a particular look at. This is called a coil and helps capture the image. Although your child's doctor may have asked, for example, for an MRI of their knee, all of your child's body will be inside of the scanner.

When your child is ready and feeling relaxed the radiographer will go into a separate room to operate the MRI scanner. The radiographer will still be able to speak to your child through the intercom and can also hear and see your child at all times. During the scan the MRI scanner makes a loud knocking sound. This is normal and your child will have been given headphones to wear to protect their hearing. It's a good idea to take your child's favourite music or story on CD so they can listen to this through the headphones whilst the scan is taking place. Usually, unless your child is having a general anaesthetic so the scan can be performed, you or another family member will be able to stay with them during the procedure as long as you can comply with the safety requirements. You should also be given headphones to wear throughout the scan for protection.

MRI scans do not hurt and last for a minimum of 15 minutes. It is very important your child lies very still throughout the scan. However, if you and/or the doctor think it will be difficult for your child to stay still, the MRI may be done under general anaesthetic but this depends on your child's age and which part of the body is being scanned. After the scan has finished the radiologist will look at the images and write a report for your child's doctor who will discuss the results with you at your child's follow-up appointment.

## Are there any risks from MRI scans?

Patients referred for an MRI or anyone accompanying them during the scan who have certain implants or metal fragments are not allowed into the MRI room. However, the radiographer will look at the safety questionnaire(s) you filled in prior to the scan and talk to you about any safety issues before deciding whether it is safe to be exposed to the scanning equipment.

## Contrast Agents

Sometimes CT and MRI scans give the doctor more information when they are done with a liquid called contrast agent. This is a special liquid which makes certain structures and areas in the body appear much clearer on the image and help to show up areas of inflammation, for example. Contrast agents used during CT (iodine-based agent) and MRI (gadolinium agent) scans are injected into the vein, usually in the arm, via a cannula (a soft, hollow plastic tube). The cannula is inserted through the skin into the vein using a needle and once the cannula is in place the needle is removed leaving a small thin plastic tube in the blood vessel. This should be comfortable and will only be in place until

the scan is finished. Sometimes, if your child requires an examination of their bowel (intestines) they may have to have a drink which contains a contrast agent.

Before your child is given any contrast agent you will be asked some safety questions to reduce the risk of your child having any reaction to them. Sometimes patients have experienced mild reactions such as nausea and vomiting, flushing, mild skin rash or hives with iodine-based agents. Patients are very rarely affected by gadolinium-based agents but may experience hives or itchy eyes and sometimes it may feel very cold as it is being injected. However, all these reactions are short-lived. Once the scan is over these contrast agents are filtered through your child's kidneys and excreted in their urine.

## Further reading

A description of all these investigations can be found in greater detail on the NHS Choices website:

- X-ray: <https://www.nhs.uk/conditions/x-ray/>
- Ultrasound: <https://www.nhs.uk/conditions/ultrasound-scan/>
- CT scans: <https://www.nhs.uk/conditions/ct-scan/>
- MRI: <https://www.nhs.uk/conditions/mri-scan/>