

What is Iodinated contrast medium (ICM)?

Iodinated contrast medium is a liquid chemical substance used in medical X-ray imaging which is injected into vein. It is often referred to as "contrast", "contrast medium", or "X-ray dye", even though it is clear and colourless because it highlights what is happening inside hollow parts of the body (like blood vessels, the stomach, bowel, or even the fluid around the spinal cord). When injected into a blood vessel, it not only shows the inside of the blood vessel but it can give information about how the organs supplied by that blood vessel are working, giving useful information for radiologists' diagnostic interpretation of images.

Why ICM is used?

ICM may provide additional information to the radiologist who is specially trained to perform procedures and to interpret your imaging. This additional information will often lead to a more accurate diagnosis which in turn will allow your doctor to better understand what is wrong and to give you the right treatment. Based on the information given on the referral by your doctor, the radiologist decides whether iodinated contrast medium (ICM) will be necessary to provide clearer images that will answer the question.

Procedures which **always** use ICM include

- **Angiograms/Angiography** which are X-rays of blood vessels,
- **Arthrogram/Arthrography** which is X-rays of joints, and
- **Myelogram/Myelography** which involves injection of contrast medium into the fluid around the spine.

Some but not all computed tomography (CT) scans require you to have ICM either by **drinking or injection** to show the insides of hollow structures like the stomach, bowel and blood vessels or to show how organs like the lungs, brain, or kidneys are working.

How is ICM (X-ray dye) given?

ICM is given by **injection** into a vein in the back of your hand or on inside of elbow OR **orally**, that is, by drinking it from a cup 1-2 hours prior to the CT scan. If the test you are having is to investigate a problem in the lower part of the bowel (the colon or rectum) a soft plastic tube may be put into your anus and the ICM will be put in through the tube.

For an **arthrogram**, the ICM is injected into a joint (like your knee, shoulder, or wrist) and for a **myelogram**, it will be injected into the lower back while you lie on your stomach. For **angiogram**, a catheter will be put into an artery, most often in your groin, to give the ICM.

The type of problem or symptom you have will determine which way the ICM must be given. Sometimes, you will need ICM to be given two different ways for the same test. For example, many CT scans will require that you have ICM to drink as well as having an injection into a vein.

If you need an ICM injection, this may be given by a radiologist, nurse, or medical imaging technologist (radiographer) injecting it manually or through a thin plastic tube inserted into your arm that may be connected to a small electric pump. A pump is commonly used to inject the ICM for CT scanning and angiograms.

How would it feel with ICM (X-ray dye) injection?

Most patients will not notice any sensations, but many patients notice a very warm feeling that spreads throughout their body for about 20 seconds during and after the injection. This is often concentrated around the groin area and you may think that you are passing urine but you are not. This is very common and goes away quickly. Occasionally, patients feel nauseous (like vomiting) for a short time during and after the injection.

How long does ICM injection take?

The injection takes between 10 and 30 seconds if you are having it into a vein in your arm.

If you are having an angiogram, you will probably have multiple injections (but only one needle) through a thin plastic tube inserted in your groin during your procedure.

For other tests such as arthrography and myelography, the contrast is injected by hand by the radiologist and this generally takes only a few seconds.

What are the risks of ICM injection and oral contrast?

As with all medical procedures, the risks need to be weighed against the benefits. Most of risks from ICM (X-ray dye) are minor. The risks associated with an ICM injection can be subdivided into allergic reactions (the medical term is "anaphylactoid") and other side effects of ICM.

Allergic reactions are unpredictable however people with known problems such as asthma, eczema, allergies to other drugs, foods, or things like pollen, dust, or chemicals are more likely to have an allergic reaction to ICM. No one can predict whether any individual person will have a reaction. Even if you have had no reaction to ICM before, it does not mean you will not have one the next time. For this reason, all radiology practices are prepared at all times to treat moderate and severe allergic reactions with appropriate medication. These reactions respond very well to emergency drug treatment.

If you have had a mild, moderate, or severe allergic reaction to ICM in the past, you MUST tell the radiology centre when you are making your appointment.

If you need to have ICM again to provide clear images, the radiologist may decide to do a different test that does not need ICM. If it is impossible to avoid giving ICM, you may require medication (tablets) every few hours for 24 hours before the procedure to decrease the chance of you serious reaction. These tablets are corticosteroids or cortisone which suppress or eliminate the potentially dangerous allergic response to ICM. It is also very likely that you will be much more closely monitored for any signs of an allergic reaction.

Allergic reactions almost always occur **within minutes** of the ICM being given. However, 2 to 4 in every 100 people have a **late reaction** (up to 1 week but usually within 2 days) after an ICM injection, usually having an itchy rash, swelling of the face or nausea. These delayed reactions generally require only treatment of specific symptoms and they resolve promptly.

Minor reactions are metallic tastes, sweating, sneezing, flushing in the face, nausea and/or vomiting, mild itchiness. Almost always these types of reactions are for short duration, for several minutes, that do not require any special treatment.

Moderate reactions consist of severe or prolonged vomiting, a generalised rash, or swelling of the face, mouth or throat, making it harder to breathe and swallow. These reactions often need drug treatment and occur in less than 1 in 1000 people.

Severe reactions are rarely occurring in 1 in every 2500 to 1 in every 25000 and that may include very low blood pressure, inability to breathe and slow or rapid heart rate (cardiac arrest). They require emergency medical treatment and admission to hospital for a period of observation. Less than 1 in every 170,000 people who have ICM injected will die as a result of a very severe allergic reaction.

Kidney - related side effects:

For people with kidney problems have increased risk of worsening of the kidney function (which is usually temporary) with ICM. Occasionally, the reduced kidney function occurred after ICM is prolonged or even permanent and you may need dialysis.

Large amounts of ICM increases the risk of kidney function deteriorating (such as in some angiograms or with multiple procedures that use ICM one after the other in a short period of time within hours to a few days of one another).

The risk of reduced kidney function for procedures like arthrograms, myelograms, and epidural steroid injections under CT guidance is virtually non-existent because of the very small amounts of ICM used.

Conditions identified that possibly increase the risk of reduced kidney function with ICM injection:

- Diabetes
- Heart failure
- Advanced age (over 70)
- Multiple myeloma (bone marrow cancer)
- Drugs: chemotherapy, some antibiotics (called aminoglycosides), some diuretics, (beta blockers)
- Non steroidal anti-inflammatory drugs (especially if you take these every day)
- Shock (very low blood pressure due to severe illness or blood loss) or dehydration
- Organ transplantation
- Gout
- HIV infection
- Collagen vascular diseases (such as rheumatoid arthritis and SLE)

Check when you make your appointment for the need of kidney function test. The radiologist may decide to do the same test without ICM or another test instead, depending on your kidney function test.

Side effects that can happen to people with certain medical conditions:

Myaesthesia gravis is muscle weakening disease. There is a small chance that your muscle weakness will temporarily get worse with ICM. As the muscles involved in breathing are also affected in this condition, you may experience more difficulty in breathing. Radiologists will generally try to avoid it if it is not essential for the test you are having, and treated.

Pregnancy and Breastfeeding

As a general rule, administration of any drug to a pregnant woman, including injecting ICM, needs to be carefully considered. There is no medical evidence that ICM can harm the unborn baby or foetus, but at the same time there are no large studies that conclusively prove that it is safe. There may be a small risk of reduced functioning of the thyroid gland of the foetus or newborn if its mother has ICM while pregnant. The thyroid gland produces hormones that are vital for normal metabolism and functioning of many organ systems in the body, including brain function. For this reason, it has been suggested that the thyroid function of the newborn be tested in the first week of life if the mother needed to have ICM while pregnant.

Other late delayed reactions

Rarely, salivary gland swelling (under and behind the jaw bone) can occur a few days after ICM as can generalised joint aches and pains. These seem to be more common in patients with abnormal kidney function.

Contrast leaking into the surrounding tissues may occur more commonly with bigger amounts of ICM, when a mechanical pump injector is used, and when the patient is very young, very old, or has difficulty with communication or is confused or unconscious. It is important to let the staff know if you experience pain during the contrast injection. This is treated quite promptly by using a cold compress on the affected area. However, occasionally, the pain, swelling, and redness can worsen and be associated with pins and needles. Then you must seek

medical attention immediately to prevent long term complications. This complication is rare and generally occurs following fairly large amounts of contrast leak under the skin.

Risks associated with drinking ICM

The ICM that you may be given to drink is usually known as Gastrografin. Oral consumption of ICM has much lower risk than than injected ICM. The main risk of Gastrografin, is in people who cannot swallow properly because they are confused, very old, very young, or not fully conscious. The ICM can produce severe breathing problems that are occasionally fatal if enough of it reaches the lungs. Great care is taken in giving ICM to people who cannot swallow properly, for this reason. The ICM may not be given at all in this situation or a different type of ICM that is safe if it gets into the lungs may be given instead.

If you are taking metformin

Patients with type 2 diabetes are often treated with metformin and to reduce weight gain, then the risk of an adverse cardiovascular event, such as a heart attack may increase. Metformin is the name of the active ingredient sold as Diaformin or Diabex, for instance.

If you are on metformin for diabetic condition with existing kidney problems, ICM may contribute to further decreasing your kidney function. Lactic acid will be accumulated in your blood stream. Your doctor generally will ask you to stop metformin and prescribe different type of medication to control your diabetes because of the small risk of lactic acidosis.

If you are taking metformin and your kidney function is shown to be normal, there is no medical evidence that you need to stop taking your metformin with normal amount of ICM at a single CT scan. Higher doses of contrast media are often used in angiography and interventional procedures and special precautions for patients taking metformin will apply.

What can be done to treat or prevent these side effects?

If you need ICM injection with pre-existing abnormal kidney function, you may be given clear fluid intravenously for few hours before the procedure to reduce the chance of your kidney function worsening. A drug called N acetyl cysteine may also be given as tablets after the procedure to help reduce the likelihood of further deterioration in your kidney function.

Intravenous fluids may be continued after the procedure as well. If you have had a previous allergic reaction to ICM, you may need tablets (corticosteroids or prednisolone) on the day before you receive the ICM to prevent or reduce the allergic reaction.

It is important to inform radiology centre of **your current and previous medical condition** that may increase the risk of reaction.

Increase your fluid intake over the next 24 hours to avoid any renal problems after ICM injection and immediately **seek medical advice** if you have any concern or experience any of reaction symptoms.

It is very important that you **discuss with your referring doctor** about your condition **before** the diagnostic imaging procedure and you are fully aware of very small but possible risks with ICM use.

How do I get my results?

The written report and images will be electronically or physically delivered to your referring doctor as soon as is practicable or will be arranged for pick up.