

## Iodine-Containing Contrast Medium (ICCM)

### General Information

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### What is Iodine-containing contrast medium?

Iodine-containing contrast medium (often just referred to as "contrast", "contrast medium", "dye", or "X-ray dye", even though it is clear and colourless) is a chemical substance used in medical X-ray imaging to show 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, which can be either an artery or a vein, it not only shows the inside of the blood vessel on the image or picture but it can give information about how the organs supplied by that blood vessel are working. Good examples of this are the kidneys, brain and lungs.

### Why do I need ICCM?

The radiologist (specialist doctor) who performs and interprets your procedure or test results, reads what your doctor has written on your referral for the test. This tells the radiologist what your doctor thinks may be wrong and what your doctor wants to know from the test or procedure. This information helps the radiologist to decide if Iodine-containing contrast medium (ICCM) will help to provide clear images that will answer the question. A radiologist is a specialist doctor who is specially trained to perform procedures using ICCM, interpret the results and provide your doctor with a report.

Procedures which always use ICCM include angiograms/angiography which are X-rays of blood vessels (see *Angiography*), arthrography which is X-rays of the inside of joints, and myelography (which involves injection of contrast medium into the fluid around the spine). ICCM helps the radiologist to see what is going on inside hollow structures like the spine, blood vessels and the space around your joints.

Some but not all computed tomography (CT) scans require you to have ICCM 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 ICCM given to me?

ICCM is given by injection into a vein in the back of your hand or on the front of your arm or elbow OR

orally, that is, by drinking it from a cup. 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 (or back passage) and the ICCM will be put in through the tube. For an arthrogram (X-ray of the joints), the ICCM is injected into a joint (like your knee, shoulder, or wrist) and for a myelogram (X-ray of the spine), it will be injected into the lower back while you lie on your stomach. For angiography, a catheter will be put into an artery, most often in your groin, to give the ICCM.

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

If you need an ICCM 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 that will inject the ICCM. A pump is commonly used to inject the ICCM for CT scanning and angiograms (X-rays of blood vessels).

### Will I feel anything when I have an ICCM 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 (see the section on risks below)

### How long does the ICCM injection take?

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

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 (see *Angiography*).

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 an ICCM injection and oral contrast?

There are some risks you should know about before having an injection of ICCM or taking it as a drink. Most of these risks are minor. As with all medical procedures, the risks need to be weighed against

the benefits. In this case the ICCM may provide additional information to the radiologist who is going to interpret your imaging (the pictures taken when you have your X-ray procedure). 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.

The risks associated with an ICCM injection can be subdivided into allergic reactions (the medical term is anaphylactoid) and other side effects of ICCM.

Allergic reactions are unpredictable and although people who know they have asthma, eczema, allergies to other drugs, foods, or things like pollen, dust, or chemicals are more likely to have an allergic reaction to ICCM, no one can predict whether any individual person will have a reaction. Even if you have had ICCM before and had no problem it does not mean you will not have a reaction the next time you have an injection of ICCM. For this reason, all radiology practices and hospital radiology departments 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 ICCM in the past, you MUST tell the radiology facility when you are making your appointment.*** If you need to have ICCM again to provide clear images, the radiologist may decide to do a different test that does not need ICCM. If it is impossible to avoid giving ICCM, you may require medication (tablets taken by mouth) every few hours for 24 hours before the procedure to decrease the chance of you having a moderate or severe reaction. These tablets are corticosteroids or cortisone which suppress or eliminate the potentially dangerous allergic response to ICCM. It is also very likely that you will be much more closely monitored for any signs of an allergic reaction than otherwise, so it is important that you let the radiology facility know that you have had a reaction before.

Allergic reactions almost always occur within minutes of the ICCM 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 ICCM injection, consisting usually of an itchy rash, swelling of the face, or nausea. These delayed reactions generally require only treatment of specific symptoms and they resolve promptly.

### 1. Minor

Minor reactions occur in about 3 in every 100 patients who receive low-osmolar, non-ionic ICCMs, which are the commonest contrast agents used in Australia for CT scanning and angiograms. These reactions include:

- Flushing in the face
- Nausea and / or vomiting
- Mild itchiness

Almost always these types of reactions do not require any special treatment and generally take only minutes to go away.

### Moderate

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

Severe reactions occur in 1 in every 2500 to 1 in every 25000 people who have injections of ICCM. They require emergency medical treatment and admission to hospital for a period of observation. A severe reaction may consist of any of the following:

- Very low blood pressure
- Inability to breathe
- Cardiac arrest (the heart stopping)

Less than 1 in every 170,000 people who have ICCM injected will die as a result of a very severe allergic reaction.

### 2. Kidney - related side effects

For people with normally functioning kidneys, ICCM is quite safe. However, if your kidney function is less than normal or you only have one kidney, you are at increased risk of worsening of your kidney function (which is usually temporary) if you have ICCM. Occasionally, the kidney function reduction that occurs after ICCM is prolonged or even permanent and you may need dialysis (purification of the blood by dialysis machine as a substitute for normal kidney function). This generally occurs in people who already have a very reduced amount of kidney function and one or more of the other risk factors listed below.

The risk is increased if you have large amounts of ICCM (such as can occur in some angiograms or if you have multiple procedures that use ICCM 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 (an anaesthetic injection into the space between the outer membrane covering the spinal cord and the overlying bones of the spine) under CT guidance is virtually non-existent because of the very small amounts of ICCM used. CT scanning and angiography use much more ICCM so the risk of kidney injury is higher, especially if your kidney function is already below normal for some reason.

***Other things that have been identified as possibly increasing your risk of reduced kidney function if you have an injection of ICCM include:***

- Diabetes
- Heart failure
- Advanced age (over 70)

- Multiple myeloma (a cancerous tumour in the cells of bone marrow)
- 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)

***If you have any of these conditions, and especially if you have more than one, you should tell the radiology facility when you make your appointment for CT scanning or angiography. It is likely that if you have any of the above conditions or current or previous kidney problems that you will need to have your kidney function tested before you can have ICCM.***

It will save you time if you have this done and have the result available BEFORE you come to the hospital or radiology facility for your procedure. Check when you make your appointment about whether you will need to have kidney function testing done. If the test shows that your kidney function is not normal, the radiologist may decide to do the same test without ICCM or another test instead, so this information is important.

***If you do not have any of the above problems or a history of kidney disease, you do not need to have kidney function testing just because you are having ICCM.***

### **3. Side effects that can happen to people with certain medical conditions**

Myasthenia gravis: People with this condition have muscle weakness that usually affects the entire body but which responds well to drug treatment once it is diagnosed. Your own doctor may suspect that you have this condition but a neurologist (a doctor specialising in the treatment of diseases and disorders of the nervous system) will usually make the diagnosis. If you have myasthenia gravis and you have ICCM there is a small chance that your muscle weakness will temporarily get worse. As the muscles involved in breathing are affected in this condition, like all of the other muscles, this could mean you experience more difficulty in breathing. Although ICCM can be given to patients with myasthenia gravis, radiologists will generally try to avoid it if it is not essential for the test you are having. If you have to have ICCM, you will be closely monitored to ensure that if you do develop breathing problems or increasing weakness this is recognised promptly and treated.

Phaeochromocytoma and paraganglioma: In the past it was thought that patients with these conditions were at increased risk of an acute and severe rise in blood pressure in association with ICCM. However, the most recent Royal Australian and New Zealand College of Radiologists guideline indicates that there is no medical evidence to prove there is an increased risk of severe hypertension (high blood pressure) in patients with either of these conditions who have low osmolar, non ionic contrast media (which are used for contrast injections in Australia).

### **4. Pregnancy and Breastfeeding**

As a general rule, administration of any drug to a pregnant woman, including injecting ICCM, needs to be carefully considered. There is no medical evidence that ICCM 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 ICCM 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 ICCM while pregnant.

Less than 1/1000th of the contrast dose given to the mother gets into the breast milk so there is no reason to stop breastfeeding if you need to have ICCM, as your milk will not harm your baby.

### **5. Other late delayed reactions**

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

### **6. Local leakage of ICCM at the injection site**

This occurs to varying degrees in about 2% of patients. It is more common with bigger amounts of ICCM, 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.

Usually, the pain and redness that leakages may cause can be treated with ice and compression and disappear quite promptly. However, occasionally, the pain, swelling, and redness can increase and be associated with pins and needles in the hand (if you had the injection in your arm) or in the foot (if the injection was around the ankle). If this happens to you after you have gone home, you must see your GP or

your nearest hospital emergency department immediately (if it is after the hours that your GP is available) as you may need urgent treatment to prevent long term complications. This complication is rare and is called "compartment syndrome" and generally occurs after fairly large amounts of contrast have leaked into the soft tissues beneath the skin.

#### 7. Risks associated with drinking ICCM

The ICCM that you may be given to drink is usually known as Gastrografin. It is different to the ICCM that is given by injection.

The risks of severe reaction with ICCM that you drink are much lower than the already low risk of injected ICCM. However, a few cases of moderate allergic reactions have been described in medical literature. Again, these seem to be much less common than if the ICCM is injected.

The main risk with ICCM that is swallowed, such as Gastrografin, is in people who cannot swallow properly because they are confused, very old, very young, or not fully conscious. The ICCM can produce severe breathing problems that are occasionally fatal if enough of it reaches the lungs. Great care is taken in giving ICCM to people who cannot swallow properly, for this reason. The ICCM may not be given at all in this situation or a different type of ICCM that is safe if it gets into the lungs may be given instead.

Kidney function problems are not seen if ICCM is given to you only to drink and is not injected. Therefore, it is considered safe for people with poor kidney function to have ICCM to drink rather than given as an injection that could make their kidney function worse.

#### 8. If you are taking metformin

Patients with type 2 diabetes are often treated with Metformin to control their blood sugar and to reduce weight gain and risk of an adverse cardiovascular event, such as a heart attack. (Metformin is the name of the active ingredient. It may be sold as Diaformin or Diabex, for instance. If you have type 2 diabetes and are on medication for it you should check if it has metformin in it.)

Metformin does not interact with ICCM so it is safe to have ICCM if you are on metformin. However, you will need to have your kidney function tested prior to having ICCM if you are on metformin. If your kidney function is reduced, you will need to consult your referring doctor who will probably advise stopping the metformin before you have ICCM. This is because the ICCM may contribute to further decreasing your kidney function which can in turn cause lactic acid to accumulate in your

blood stream. This is called lactic acidosis and is a rare but recognised problem in people who take metformin when they have significantly decreased kidney function. If you are taking metformin, it is very likely that your doctor is checking your kidney function regularly anyway because deterioration in kidney function that is significant will generally lead your doctor to stopping metformin and giving you another drug 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 if you are having a normal amount of ICCM with 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 are the benefits of an ICCM injection?

The radiologist will have decided that the benefits of having ICCM outweigh the risks outlined above, which are uncommon in most healthy people. Radiologists use ICCM to make the images clearer and therefore to allow the most accurate answer to be given to your doctor. This results in the right treatment plan for your symptom or condition.

#### Who will give me the ICCM injection?

Depending on the kind of procedure you are having, a radiologist (a specialist doctor) or a radiology nurse or a medical imaging technologist (radiographer) will give you the injection. For CT scanning and angiography, often a small electrical pump will be used to inject the ICCM.

#### Where is an ICCM injection done?

This will be done in the CT scanning room or the angiography suite or in the fluoroscopy room while you are on the examination table having your scan or test. (Fluoroscopy is the process of viewing X-ray images on a screen rather than taking and developing X-ray pictures.) If you are required to drink ICCM you may be asked to do this an hour or two before your CT scan (in the waiting room or in your hospital bed if you have been admitted).

## If I have side effects from the ICCM injection, when will they occur? What can be done to treat or prevent these side effects?

If you have abnormal kidney function and it is decided that you need ICCM, you may need a few hours of clear fluid given intravenously (directly into a vein) before your procedure to reduce the chance of your kidney function getting worse. 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 after ICCM. Intravenous fluids may be continued after the procedure as well.

**If you have an increased risk of ICCM worsening your kidney function but need to have this procedure done, making sure you have a kidney function test beforehand is the best way of preventing further worsening of your kidney function.**

If you have had a previous allergic reaction to ICCM, you may need tablets (corticosteroids or prednisolone) on the day before you receive the ICCM to prevent or reduce the allergic reaction.

For more details about these side effects, please see the section on risks above.

### **Please note:**

This information is of a general nature only and is not intended as a substitute for medical advice. It is designed to support, not replace, the relationship that exists between a patient and his/her doctor. It is recommended that any specific questions regarding your procedure be discussed with your family doctor or medical specialist

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