

## Selective Internal Radiation Therapy [SIRT]: SIR-Spheres®

### Consumer Information

#### Contributors:

A/Prof Lourens Bester

*MB, Ch.B, BSc (Hon) Pharm, MFGP, M.Med.Rad. (D), FRANZCR, FACP*

Dr James Burnes, Ms Ann Revell, Dr Christine Walker, A/Prof Stacy Goergen

### What is SIRT?

Selective Internal Radiation Therapy (SIRT) is a treatment for liver cancers or tumours that delivers millions of tiny radioactive microspheres or beads called SIR-Spheres® directly to the liver tumours.

SIR-Spheres® are about one third the diameter of a strand of hair in size and they release a type of radiation energy called 'Beta' radiation. Beta radiation is a common type of radiation used in other nuclear medicine therapy and diagnostic procedures.

SIR-Spheres® are approved for the treatment of liver tumours that cannot be removed by surgery. These may be tumours that start in the liver (also known as primary liver cancer), or they may be tumours that have spread to the liver from another part of the body (also known as secondary liver cancer or metastases).

To perform SIRT, a small puncture or incision is made in the groin and a small thin tube called a catheter is placed in the artery and guided into the liver using X-ray pictures or images. SIR-Spheres® are delivered through the catheter and are then carried by the bloodstream directly to the tumours in the liver where they only lodge in the small vessels feeding the tumour.

The majority of SIR-Spheres® are lodged in the outside edge of the tumour/s and the radiation has a direct destructive effect on the tumour itself and the vessels feeding the tumour. Destroying the vessels feeding the tumour means that the tumour/s can no longer be supplied with the nutrients in the bloodstream. Most patients after SIRT will see a reduction or stabilisation of their liver tumours.

For most patients, treatment will result in increased survival time, but not a permanent cure.

### How do I prepare for SIRT?

Your treatment team will want to know about your previous cancer history and any other medical conditions you may have. They will then conduct a number of initial tests to ensure that it is possible for you to receive SIRT safely. You will normally have two procedures where you will be conscious (awake) but you may have some sedation to make you drowsy so that you feel comfortable.

The treatment requires an overnight stay in hospital. Your treating doctor will advise what arrangements need to be made for hospital admission. You may need to check with the hospital what you need to bring with you for admission.

### What happens during SIRT?

SIRT normally comprises two procedures:

#### Preparation or "work-up"

The first procedure for SIRT is the preparation phase for the treatment commonly known as the work-up, that includes a radiology procedure known as an angiogram (see Angiography). The purpose of the angiogram or mapping is to prepare your liver for SIRT.

In preparation for the angiogram you will have blood tests to evaluate your kidney function and blood clotting. During the mapping procedure your interventional radiologist (a specialist doctor) may block (embolise) some of the liver blood vessels communicating with other blood vessels to minimise the potential for the SIR-Spheres® to travel to areas outside your liver (e.g. the stomach or intestine).

You will also receive a small amount of radioactive spheres (MAA) similar in size to SIR-Spheres® to check the amount of blood that flows from the liver to the lungs. This is also a trial run to see how the SIR-Spheres® will behave when injected into your body.

During the angiogram a small amount of dye (or contrast medium) is injected through a catheter (a thin plastic tube) inserted into an artery. The dye travels down the catheter into the liver and highlights the vessels. Images or pictures are taken throughout the procedure.

The interventional radiologist now has a map of your liver vessels to follow so that the catheter can be advanced closer to the site of the tumours in the liver. Most patients say they feel a little warm when the dye is injected. Throughout the whole procedure you should try to stay as still as possible to avoid moving or dislodging the catheter in place.

This work-up angiogram is done in a conscious state (awake) and a local anaesthetic is given so that the discomfort from the procedure is minimal around the puncture wound.

The work-up procedure for SIRT is normally done on an outpatient basis. You will be observed after the work-up procedure and may then return home. While you are being observed your doctor will review the X-ray images to determine your suitability for SIRT and to see if you are suitable to proceed with the SIR-Spheres® implant.

#### Implant of SIR-Spheres®

You will need to return to the hospital within 7-10 days of the work-up when a second angiogram is performed to implant the SIR-Spheres® (SIRT). It is

identical to the work-up angiogram except that SIR-Spheres® are inserted.

For the procedure you are admitted to hospital and then taken on a bed to the angiography suite.

Once inside the angiography suite an interventional radiologist (a specialist doctor) will perform the second angiogram. You do not need to fast before the angiogram. The purpose of the angiogram this time is to implant the SIR-Spheres®. The catheter used during the angiogram is then guided by the interventional radiologist through the artery and placed close to the tumours in the liver.

While the implantation angiogram is taking place, the nuclear medicine department prepares an individually prescribed dose of radiation for you (SIR-Spheres®). The prescribed dose of SIR-Spheres® is put into a specialised perspex box which is transported from the nuclear medicine department to the angiography suite where your catheter is being inserted.

The perspex box is then brought to the side of the bed and the catheter inserted into your artery is connected to the perspex box. Once connected the system is then ready for the infusion of SIR-Spheres®.

SIR-Spheres® are then infused from the perspex box through the catheter into your liver. During this infusion the radiologist may also insert contrast medium into the catheter to ensure that the catheter has not moved during the procedure. This whole procedure may take about 60 minutes. Once the infusion is complete, the catheter is then removed from the liver and the box used to deliver the SIR-Spheres® microspheres is then taken back to the nuclear medicine department.

Once the catheter has been removed, the interventional radiologist will compress the puncture wound where the catheter was inserted for around 10 minutes. This compression is done to stop excess bleeding at the site of the puncture. You then stay near the angiography suite for about 3 hours for observation to ensure there are no problems following the procedure. After observation you are taken to a general ward for an overnight stay.

In rare circumstances, on the advice of the treating doctor, you may be required to stay more than one night in hospital. Most patients are discharged the day following the procedure.

You may experience pain and nausea during the implantation process. The interventional radiologist and the angiography team will make sure that you receive the necessary medications to make you comfortable.

SIRT is usually done as a single treatment but some patients may be re-treated with SIRT. Re-treatment may occur in rare circumstances and may be indicated where new tumours grow in the liver despite SIRT, or previously treated tumours start to enlarge.

## Are there any after effects of SIRT?

You should not have any serious after effects when SIR-Spheres® are correctly administered. You may experience some of the following side-effects or you may not experience any side effects at all:

- *Pain in the abdomen that may last for a few hours:* This can be well controlled with pain medication.
- *Nausea may be caused by the angiography contrast medium that is injected into the vessels or as a result of the SIR-Spheres® infusion into the liver:* This is a short term effect (several days) which can be well controlled with anti nausea medication.
- *Reduced appetite:* Some patients may feel a loss of appetite for several days.
- *Tiredness:* This may be caused by the effect of the radiation on the liver tumours and may last several days.
- *Fever:* The destruction of the liver tumours and the by products of this destruction may cause a short term fever (up to a week). This can be well controlled with paracetamol or a similar over the counter analgesic.
- *Radiation in the body:* Your treating doctor will advise you on the effects of radiation and will advise that contact with other people should be minimised for at least the first week after treatment. This means that prolonged, close physical contact should be avoided, such as, sitting/sleeping next to children or pregnant women. Please feel free to discuss this with your radiologist.

## How long does SIRT take?

As previously described, SIRT involves two procedures.

The work-up procedure for SIRT may take about 90 minutes, and is normally done on an outpatient basis. You will be observed for three hours after the work-up procedure and may then return home.

While you are being observed, your doctor will review your X-ray images to determine your suitability for SIRT and to see if you are suitable to proceed with SIRT. You need to return to the hospital within 7-10 days for the SIR-Spheres® implant angiogram.

The second part of the procedure, the SIR-Spheres® implant may take about 60 minutes. Your groin puncture wound will be compressed for approximately ten minutes. The puncture wound is compressed to stop bleeding at the wound site. You will be observed for three hours and then taken to a general ward for an overnight stay at the hospital.

The time taken for the two SIRT procedures is significantly less than may be encountered with regular weekly or bi-weekly chemotherapy treatments.

## What are the risks of SIRT?

There are possible risks with SIRT. Your treating interventional radiologist is a highly trained specialist doctor who is experienced with minimising the risks for this procedure.

The risks of the procedure are:

- Inadvertent delivery of SIR-Spheres® to the stomach or pancreas may cause abdominal pain and nausea, acute pancreatitis or peptic ulceration (stomach ulcer).
- High levels of implanted radiation and/or excessive shunting of SIR-Spheres® to the lung may lead to radiation pneumonitis (too much radiation to the lungs). Shunting to the lungs may occur in rare circumstances with liver cancer patients. Shunting to the lungs is caused by an excessive pressure build up in the blood in the liver. This pressure build up is caused by the increased amount of blood that is flowing from your liver arteries to supply the liver tumours. Occasionally this pressure becomes so great that this blood is 'shunted' or moved from the liver to the lungs. This may result in a dry cough in the lungs. All patients that have SIR-Spheres® will have their suitability for treatment assessed in the work-up phase. Patients deemed to be a risk for radiation pneumonitis would not be recommended to undergo SIRT.
- Excessive radiation to the normal liver may result in radiation hepatitis (too much radiation to the liver). Patients who are considered at risk of this would not be recommended to undergo SIRT due to the poor liver function of the patient as a result of their liver tumours.
- Inadvertent delivery of SIR-Spheres® to the gall bladder may result in inflammation of the gall bladder.

You should discuss these risks with your treating radiologist so that you can consider the benefits of the treatments with the risks before you both make a decision.

## What are the benefits of SIRT?

The benefits of SIRT have been demonstrated in the following areas:

- Combining SIRT to standard chemotherapies provides greater survival benefit than just using chemotherapy alone.
- Survival benefit has been demonstrated in patients whose cancer has not responded to all forms of chemotherapy and then received SIRT as a sole treatment.
- Reducing the sizes of tumours.
- Reducing tumour sizes to the point that liver surgeons can remove the tumour from the liver.
- Improving quality of life for the patient.
- Allowing some patients to have a liver transplant.

## Who does SIRT?

SIRT is performed by a number of different doctors and hospital departments working closely together. A patient who is being considered for SIRT is firstly carefully assessed by the referring doctor for suitability. A referring doctor is usually a specialist and can be a medical oncologist, surgeon, gastroenterologist or other specialist doctor. If your referring doctor thinks you are suitable for SIRT they will send a fax or letter to the interventional radiologist for you to be assessed for suitability to undertake SIRT.

An interventional radiologist (a specialist X-ray doctor who uses X-ray equipment to perform operations on patients) performs the SIRT procedure. The interventional radiologist is responsible for performing the work-up procedure and assessment of patient suitability to undertake SIRT. It is important to be aware that the majority of patients will be suitable for SIRT. The interventional radiologist works closely with a nuclear medicine doctor to review scans following the work-up procedure to determine if you might be suitable to undertake SIRT.

The nuclear medicine doctor is also closely involved with the procedure, and in conjunction with the interventional radiologists both doctors are responsible for two areas. These areas include the procedural (treatment related) as well as diagnostic and consulting (i.e. interpreting scans and advising other doctors and the patient on the treatment approach and results of treatment).

The procedural aspect involves all work done in the angiography suite and the SIR-Spheres® dose preparation done in the nuclear medicine department. The angiography suite is a specially equipped room in the radiology department where all interventional radiology procedures are performed. The interventional radiologist will perform the patient catheterisation and SIR-Spheres® dose infusion and will take necessary CT scans.

## Where is SIRT done?

SIRT is performed within the angiography suite in the radiology department within the hospital. The angiography suite is a special room where scans of the patient can be performed and specialised procedures called 'interventional procedures' are performed by the interventional radiologist. Interventional procedures are a sub specialised area of radiology where a catheter is inserted into the artery or vein of the patient.

## When can I expect the results of my SIRT?

The aim of SIRT is to reduce the size of tumours in the liver so as to be able to prolong the life of the patient, while at the same time maintaining or improving quality of life. After SIRT your doctor may assess the results of your treatment in a number of ways including the following:

### Computed Tomography (CT) scan

A **CT Scan** (sometimes know as a CAT scan) is a radiology image of the liver where the tumours can be seen. Prior to your SIRT you will have a CT scan. This initial scan is done before your SIRT and is sometimes known as a "baseline" scan and is used to compare with scans taken after SIRT. This follow up scan can then be used by your doctor to see if your tumours have reduced in size since the treatment. The follow up CT scan is normally done from 4 weeks up to 3 months after your treatment.

### Positron Emission Tomography (PET) scan

A **PET scan** is another type of scan that is sometimes used by your doctor to determine your response to SIRT. If your doctor determines that you require this scan you will have a scan before your treatment and another scan following your SIRT.

### Tumour markers

Your doctor may wish to follow up your response to SIRT by looking at certain tumour breakdown products also called "markers" in your blood. A tumour marker is a substance found in the blood which may be elevated or higher in cancer. As SIRT acts to destroy the liver tumours, your doctor may take a blood sample before your SIRT and another blood sample after your treatment to evaluate whether there has been a reduction in the marker over time. Your doctor will monitor one or more of these markers. A common marker for colorectal cancer is called CEA (Carcinoembryonic Antigen)

### Useful websites about SIRT:

- Information about SIR-Spheres® microspheres can be found at the manufacturer's website: [www.sirtex.com](http://www.sirtex.com)
- Ci-SCAT under the auspices of Cancer Institute NSW is currently in the process of including the protocol for SIR-Spheres® into their website: [www.treatment.cancerinstitute.org.au/cancerinstitute/](http://www.treatment.cancerinstitute.org.au/cancerinstitute/)

#### 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

The QUDI Program is managed by the Royal Australian and New Zealand College of Radiologists and funded by the Australian Commonwealth Department of Health and Ageing.

**Publication Date:** May 1st 2009

The RANZCR is not aware that any person intends to act or rely upon the opinions, advices or information contained in this publication or of the manner in which it might be possible to do so. It issues no invitation to any person to act or rely upon such opinions, advices or information or any of them and it accepts no responsibility for any of them.

The RANZCR intends by this statement to exclude liability for any such opinions, advices or information. The content of this publication 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. Some of the tests and procedures included in this publication may not be available at all radiology providers.

The RANZCR recommends that any specific questions regarding any procedure be discussed with a person's family doctor or medical specialist. Whilst every effort is made to ensure the accuracy of the information contained in this publication, The RANZCR, its officers, councillors and employees assume no responsibility for its content, use, or interpretation. Each person should rely on their own inquiries before making decisions that touch their own interests.